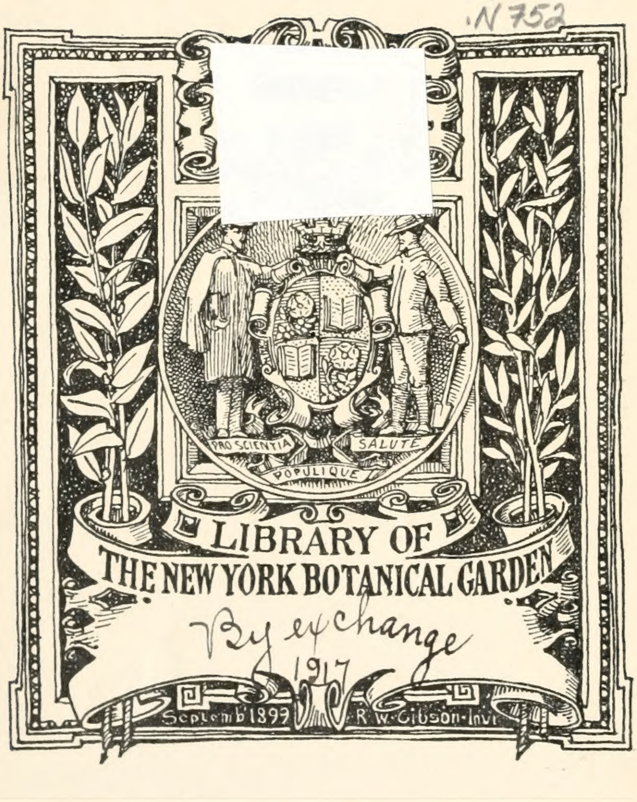
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Twenty-eighth Annual Report

of the

New York State College of Agriculture

at Cornell University

and of the

Agricultural Experiment Station

Established under the Direction
of Cornell University
Ithaca, New York

1915

VOLUME II

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Cornell Rural School Leaflet

FOR BOYS AND GIRLS

Published by the New York State College of Agriculture at Cornell University, B. T. Galloway, Director; George A. Works, Head of the Department of Rural Education. Entered as second-class matter at the post office at Ithaca, New York

ALICE G. McCLOSKEY and EDWARD M. TUTTLE, Supervisors and Editors

ARTHUR D. DEAN, C. H. TUCK, W. E. PIERCE, and G. F. WARREN, Advisers

Vol. 8 ITHACA, NEW YORK, NOVEMBER, 1914 No. 2

GREETINGS

This is the first leaflet for boys and girls for the year 1914-1915, and we wish to send you greetings. We hope that you will feel our interest in all that you are during the coming year, and in all that you do. Boys and girls in the country have the best opportunity for education, because where

Identifying specimens of plants

there are open fields and autumn colors, and wild, sweeping winds, and crops to care for and stock to feed, there is better opportunity to grow than in the crowded city streets. Your lives may be deepened and enriched by the out-of-doors, and by the many farm tasks that become a joy as soon as you know how to do them well.

We hope the boys and girls in the country will have high ideals of country life and will work toward bringing about their realization. No one wants to live in the country in poor homes where there is

little food, and where the fireplaces are all closed up because there is no wood to burn in them. There is opportunity for all to have education leading to successful farming, which will mean attractive homes set in the midst of trees, in sight of stretches of field and woodland, and perhaps within sound of running brooks. There can be well-filled larders with ample stores of harvest crops, great wood fires can be ablaze for the Thanksgiving sports and pastimes, and for the return of sleighing parties during the Christmas holidays. And then all the time there will be the long, tranquil nights for sleep, and the glory of the early dawn. Often there will be heard the wonderful sound of singing pines, the restful tone of a distant church bell, the music of the brook, and the notes of the whippoorwill as he sings at twilight on the old fence. The farmer's life may be one of deep, rich joy; but this can come only when the farmer is prosperous, and at the present time in order to be fully prosperous he must have education for his work.

In these words of greeting we ask the boys and girls of New York State to decide to strive for the opportunity that will make for prosperity on the farm. Then, if you go to the city the fact that you have worked with mind and hands, that you have taken responsibility, will be of real value; and if you remain in the country you will be one with the out-of-doors, and ready to meet your business problems. You will be useful to all in your community, and a credit to your State.

Success to you in the work of the year. We hope you will celebrate Corn Day, will be represented in some of the exhibitions at Cornell during Farmers' Week, will learn more than you have ever known about horses, birds, trees, weeds, and other things of farm interest, will write to Mr. Tuttle about your work, and will tell us all about the Thanksgiving dinner and what you contributed to it. Then at Christmas time we want you to believe that, although you cannot hear them, we are sending greetings to you and our best wishes for a Happy New Year.

THE YEAR'S WORK

There is much that is interesting in the lessons in nature study and agriculture for boys and girls this year. You are expected to learn something about the natural history of the farm, and also to take part in some of the farm and home work that will help in your education. Long ago the only kind of teaching was from books, but now we know that the best kind of teaching prepares us to be keen observers, to work with our hands as well as our minds, and to learn while we are young to take responsibility. Let us, then, work hard this year, not only in the regular school studies, but also in trying to know and to understand nature and to take our part in the care of the farm, the home, and the school. We hope that during the first months of this year special attention will be given to the following topics:

A horse with good proportions

I. HORSES

Horses are important on the farm, and every boy and girl should have an intelligent knowledge of them and should learn to understand them. When we think of the contribution that horses make to our lives, and realize how many persons fail to take care of them wisely or to show appreciation of their help, we feel how necessary it is to have better knowledge of them.

In the teachers' leaflet this year there is much good information about horses, which will from time to time be used in your lessons in nature study and agriculture. In order that we may know how much you have profited by these lessons, we are going to ask you to tell us about your work, and perhaps the following plan will be an interesting way for you to do this.

We will send a book on horses to the school that prepares during the year the best notebook on horses. The notebook may be made of plain manila paper, and should contain as much information and illustration as you can collect throughout the year. We shall judge the work in the main according to the value of the information contained in it, although some credit will be given for attractive presentation of the material. The most important contribution to the book will be first-hand knowledge that boys and girls have gained by actual observation of horses in the neighborhood, and by discussion with persons who have been successful in the breeding of them. In judging the work from the various schools, the book knowledge and pictures that are added will be second to this actual study of horses. In making plans for your books we hope you will consider the following:

1. A good survey of the horses in your neighborhood. This will be valuable work for the older boys and girls. The number of work horses in the neighborhood, the number of carriage horses, and the like.

2. Who has the finest horses in your neighborhood? It would be a good thing to ask the owner to visit the school and tell something about the history of them, the care they need, and other matters of interest. An account of such an experience would make a valuable addition to your book.

3. Has any boy or girl in the neighborhood a pet horse? Could it be brought to the school yard and studied there? If so, have some one tell about this incident, and if possible add a photograph of the horse.

4. The book should contain information as to what constitutes a well-proportioned horse. Let every boy and girl make a drawing of a horse that is well proportioned.

5. Types of horses should be discussed. How many types are there in your neighborhood?

6. How can the age of a horse be estimated?

7. There should be some discussion on the harnessing of horses.

8. Perhaps some of the boys have had experience in training horses. There should be at least one chapter in the book devoted to this topic.

9. Try to learn something of the origin and development of the horse. How did the earliest horses differ from those of the present time?

10. Tell the story of some famous horse that you have heard of or read about.

II. BIRDS

We hope that every boy and girl will do something to attract the birds this year. Ask your teacher to read to you what is said in the September leaflet about this. Have a feeding station for the birds as suggested by Doctor Allen. Some day you may have such interesting guests as a chickadee, a junco, a tree sparrow, or a woodpecker.

A chickadee receiving a welcome meal

Did you know that there are about twelve hundred different kinds of sparrows in the world? How many kinds can you learn to know this year? What can you learn of the habits of the English sparrows by actual observation? What do they eat? Where do they build their nests?

Confidence

Make your bird houses now and fasten them in the places you have selected so that they will become weather stained and lose their new appearance before spring.

It is interesting work to make a collection of the old nests of birds. Practically all birds build a new nest each year, and there is no harm in taking the old one. Much can be learned from studying the nests.

Keep a list of the birds that winter in your neighborhood.

Tell Mr. Tuttle, in your letter to him, whether you have learned the poem on page three of the teachers' leaflet.

III. TREES

There is never a time of the year when tree study is uninteresting. In the winter we have evergreens still holding their leaves and adding beauty to the winter landscape. You will be interested in these when you are

A fine chestnut tree

selecting your Christmas tree. How many different evergreens can you find? This year you are to study particularly the hemlock, the white pine, and the cedar, and among the deciduous trees to make a special study of the elm. How can you tell an elm in winter? Where have elms been recently planted in your neighborhood? How are these trees valuable? How tall do elms grow? In what kind of soil do they thrive best?

Are you preparing some mounts for the exhibit at Cornell University during Farmers' Week? Be sure not to injure trees in order to make these mounts. The teachers' leaflet gives full explanation for the exhibition held in Farmers' Week, and we are hoping that your school will send something for it. See pages 154 and 227.

IV. WEEDS

Weeds are everywhere. The farmer and the gardener have to struggle with them constantly in order to give the cultivated crops the best opportunity to grow. There are many very bad weeds in New York State, and there is always danger that a new weed will come into the State and spread before it is recognized as harmful.

Boys and girls can help to protect the community against bad weeds. It is first necessary to learn to recognize the weeds, and to know something of the habits of each one and the places where the weeds grow. It is also valuable work to learn to indentify the seeds of the common weeds, so that they can be discovered if present in the farm seeds that are sown.

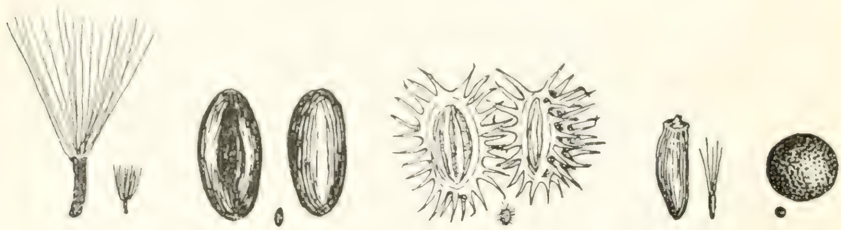
In the fall many weed seeds can be collected from the seed heads on the dead stalks along the roadways and fence rows and in old fields and pastures. We hope that many schools will begin to make a collection of the seeds of all the weeds in their communities, and to make a careful study of the different kinds until each boy and girl can recognize them.

As a beginning we would suggest for study the five weeds given in the syllabus for work this year: Canada thistle, wild carrot, wild mustard, orange hawkweed, and long-leaved plantain, or ribgrass. With a little search most of these can be found in every locality. Pictures of the seeds of these weeds are given on the next page, as a help in the study of them.

There are various ways of preserving seeds for examination. Often they are kept in small bottles, or are mounted on cardboard in a drop of glue. Probably the best way, and a very simple one, is as follows: Take two pieces of glass of the same size; they may be large or small, depending on the number of kinds of seeds for one mount. Cut a piece of heavy cardboard the same size as the glass. If thick cardboard is not available, use two or more sheets together. On the cardboard draw rows of circles one half to three quarters of an inch in diameter; one of the boys will like to cut out these circles with a sharp knife. Lay the cardboard on one

of the pieces of glass, and in each of the round pockets place a few seeds of some weed. Write the name of the weed on the cardboard just below the pockets. When all the spaces are filled and labeled, lay the other piece of glass on top, and bind around the edges with passe partout tape. Then you will have a collection of seeds that can be kept and studied because they can be easily seen between the glass through the openings in the cardboard. Do not entirely fill the openings with seeds, because then it would not be possible to shake one seed away from the others in order to study it by itself.

In working with small weed seeds, a lens of some kind is very useful. Many schools have a small tripod lens or a pocket lens, but if these are not available some one in the neighborhood will have a magnifying glass, such as is used for reading. This will do quite as well. With any of



1. 2. 3. 4. 5.

Seeds of five common weeds, natural size and much enlarged: 1, Orange hawkweed; 2, long-leaved plantain, or ribgrass; 3, wild carrot; 4, Canada thistle; 5, wild mustard

these lenses the seeds in a mount, such as the one described above, can be studied closely, because they can be seen through the glass and the lens can be held close to them.

If every school would begin a collection of weed seeds at once and obtain at least the five weeds given in the syllabus, it would be a fine start. The study of weed seeds is going to lead to something that will be of great interest to the community, and that is the testing of farm seeds. The January leaflet will tell about this, but we must first get ready by learning to know weed seeds when we see them.

Perhaps some schools will want to buy a book to help with this work. There is an excellent one entitled "Farm Weeds," which may be obtained for one dollar from the Superintendent of Stationery, Government Printing Bureau, Ottawa, Canada. It contains pictures of all the common weeds and of their seeds. Many of the illustrations are in color, and this will help you in identifying your specimens. If you find any weed that is not known in the neighborhood nor described in any of your books, send it to us and we will tell you about it. We shall be glad to receive special reports from schools on weed study.

CORN DAY

(Friday, December 4, 1914)

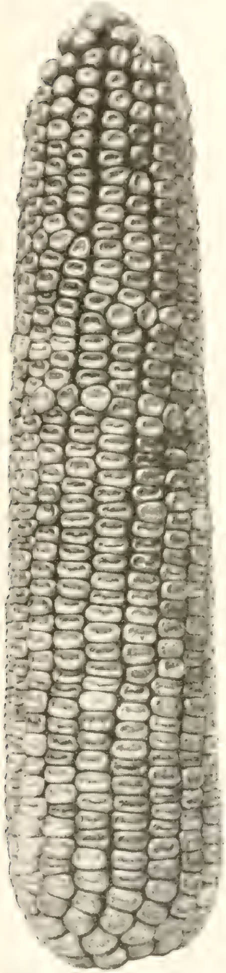
THIS leaflet should reach you shortly before Corn Day. All your plans will have been made, following the suggestions given to your teacher in the September leaflet on page 211. Make it a better celebration than ever before. It has been a bountiful year, and we have good reason to be grateful at this season of Thanksgiving. Corn Day offers an opportunity for your fathers and mothers, and relatives and friends, to gather with you at the schoolhouse for an afternoon at the close of the harvest season.

You will send out carefully prepared invitations that you have made in the drawing class. Some of you will learn poems or bits of literature about the corn plant. Others will write compositions on the types of corn or the selection of good seed ears, the preparation of the soil, planting the corn, cultivation, the corn harvest, the uses of the corn plant on the farm, its use as food and for other purposes, and like subjects. These will be read on Corn Day. Others will make a report about the corn crop in the neighborhood, how large it was, who raised the most, what was the highest yield per acre, how the corn was stored, what methods were used to select and preserve seed for another year, and such things that will interest every one. The schoolroom will be decorated with cornstalks, pumpkins, and the fruits of the harvest time. There will be a good table for the exhibit of ears that you have selected as most nearly perfect, following the outline in the September leaflet. Some one in the neighborhood who has been successful in raising good corn will talk to you a little and will judge the ears that you have brought, selecting the best of each type. Corn Day will then mean not only a greater interest in an important crop, and a desire to improve it, but also a new feeling of good will between young and old, and a better understanding of the value of the study of out-of-door life as it is found naturally and on the farm.

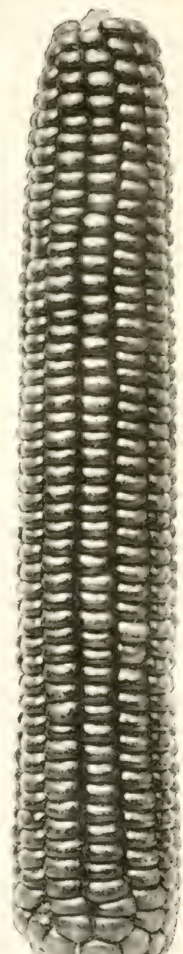
You will all be interested to hear of the school exhibit of corn at Farmers' Week last year. Soon after Corn Day a year ago, ears of corn began coming to the College from schools in all parts of the State. Each school sent one ear, or two ears if flint and dent could be obtained. These ears were those that in the rural school had been judged best on Corn Day. They were nicely labeled according to the form which we have given again this year on page 215 of the teachers' leaflet. All the corn was unwrapped and

carefully stored in a safe place. We were pleased to find how well the labeling and wrapping had been done.

A careful record was kept of every school sending corn, and at the end of this article you will find a complete list of all the schools represented in the exhibit. There were eight hundred and ninety-six of them. At the time of Farmers' Week in February, the fine, new auditorium of the College of Agriculture had just been completed, and the corn exhibit from rural schools was arranged in the broad, semicircular hall of that building. Special racks were made in sections that fitted between the exit doors of the assembly room. They were covered with buff-colored cloth that was in harmony with the wall of the auditorium, and hemlock boughs were fastened to the supports of the racks, adding a touch of bright color. When finished the racks held a double row of corn one hundred and fifty-three feet long, one row lying flat and the other standing on a slant behind it.



Dent corn. State prize, Farmers' Week, 1914



Flint corn. State prize, Farmers' Week, 1914

The ears were sorted and arranged by counties, supervisory districts, townships, and school districts, so that every school could be located, and visitors could look for their home districts.

Early on Monday morning of Farmers' Week, the corn was judged by Doctor Gilbert and his assistants, and two prizes were awarded in each county, one for the best ear of flint corn and one for the best ear of dent corn, when both types were present. There were fifty-three prizes for flint and forty-three prizes for dent corn. The prizes were blue ribbons with bronze letters.

Then came the important question of the two prizes for the State as a whole, which were awarded as follows:

Dent Corn—District 10, Town of Newfane, Niagara County. Vesta McKee, teacher; W. D. Wisner, district superintendent

Flint corn—District 6, Town of Hamlin, Monroe County. G. Fern Brooks, teacher; Fred W. Hill, district superintendent

Books were sent to these schools in addition to the blue ribbons.

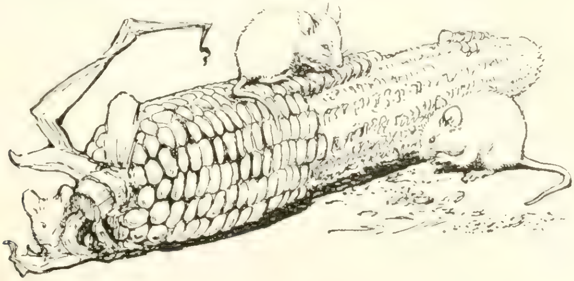
The ninety-six prize ears of corn were mailed back to the schools from which they came, and we have heard from many of them that the corn was kept and planted. We expect that some of the corn sent this year will be the product from these prize ears, and have suggested to the teachers that they mark such corn with a red ribbon and write us a letter about it. Year by year the corn crop will grow better because of the work the boys and girls are doing in selecting good seed.

On Friday and Saturday of Farmers' Week, ears of corn were given away to visitors who desired them and who would agree to write to the schools that sent the corn telling them where it was and what was done with it. Many did this, and so the good work spread all over the State. Ask your teacher to read you the letters on pages 216 and 217 of the September leaflet. You will find also, on pages 218–221, a list of all the prize schools, and you can see who won the prizes in your county.

Altogether the corn exhibition was a great success, and we are proud of the girls and boys who contributed to it. We expect this year that twice as many schools will be represented and that the corn will be much finer because of the good season we have had. So be sure to hold Corn Day on December 4; have a good program and exhibit, invite the whole community, have the corn judged, and label, wrap, and mail the best ear of flint or dent, or both, to

Edward M. Tuttle,
College of Agriculture,
Ithaca, New York

The corn should reach us not later than January 31, 1915. Do not fail to have your school represented in the list next year.



LIST OF SCHOOLS SENDING CORN TO FARMERS' WEEK, 1914[1]

Albany County

1st supervisory district—Newton Sweet, district superintendent
Town of Bethlehem, District 7
3d supervisory district—W. S. Clark, district superintendent
Town of Guilderland, District 11

Allegany County

1st supervisory district—G. W. D'Autremont, district superintendent
Town of Caneadea, Districts 3, 6*, 7, 8
Town of Rushford, Districts 1*, 10, 11

Broome County

2d supervisory district—J. E. Hurlburt, district superintendent
Town of Conklin, Districts 1, 2
Town of Dickinson, District 1
Town of Kirkwood, Districts 2*, 4, 5*, 9
Town of Windsor, Districts 11, 14, 15, 19
3d supervisory district—Mabel L. Watrous, district superintendent
Town of Binghamton, District 4
Town of Maine, Districts 1, 2, 4, 6, 9, 10, 11, 12*, 13
Town of Union, Districts 2, 3*, 9, 11, 14, 15, 18
Town of Vestal, Districts 1*, 2, 4, 6, 8, 10, 12, 15
4th supervisory district—E. B. Whitney, district superintendent
Town of Barker, Districts 5, 8
Town of Chenango, Districts 1, 2, 4*, 8, 9, 10
Town of Lisle, Districts 2, 10
Town of Nanticoke, Districts 4, 5, 6
Town of Triangle, District 7

Cattaraugus County

5th supervisory district—E. A. Stratton, district superintendent
Town of Conewango, District 1*
Town of Leon, District 3*
Town of Randolph, District 10*
Town of South Valley, District 3

Cayuga County

1st supervisory district—H. S. R. Murphy, district superintendent
Town of Ira, District 3*
Town of Sterling, Districts 8*, 10*, 11*
Town of Victory, District 10
2d supervisory district—O. W. Wood, district superintendent
Town of Cato, District 8*
3d supervisory district—Mrs. Anna M. Kent, district superintendent
Town of Fleming, District 1*
Town of Ledyard, District 3*
Town of Springport, Districts 2*, 5, 8*

Chautauqua County

3d supervisory district—J. M. Barker, district superintendent
Town of French Creek, District 7*
Town of Harmony, District 21
4th supervisory district—P. E. Marshall, district superintendent
Town of Sherman, District 3
5th supervisory district—L. W. Swain, district superintendent
Town of Pomfret, District 3*

Chemung County

1st supervisory district—W. C. King, district superintendent
Town of Catlin, District 2*

Chenango County

1st supervisory district—Ellen E. Baldwin, district superintendent
Town of Plymouth, District 5
3d supervisory district—J. S. Childs, district superintendent
Town of German, District 8
Town of McDonough, Districts 1, 2*, 4, 7
Town of Oxford, Districts 4, 6, 16*
Town of Preston, Districts 7, 8
Town of Smithville, Districts 3, 7
4th supervisory district—Jane I. Schenck, district superintendent
Town of Greene, Districts 9, 12, 16*, 19*, 22
5th supervisory district—Mary L. Isbell, district superintendent
Town of Guilford, District 17

[1] * indicates schools sending both flint and dent ears.

Clinton County

- 1st supervisory district—O. A. Wolcott, district superintendent
  - Town of Ausable, District 8
  - Town of Black Brook, Districts 6, 12
  - Town of Peru, District 2
  - Town of Schuyler Falls, Districts 3, 5
- 3d supervisory district—Clara E. Soden, district superintendent
  - Town of Beekmantown, District 7

Columbia County

- 1st supervisory district—S. B. Smith, district superintendent
  - Town of Canaan, District 1
- 3d supervisory district—E. A. Smith, district superintendent
  - Town of Ancram, District 4
  - Town of Taghkanic, District 4*

Cortland County

- 1st supervisory district—E. W. Ellis, district superintendent
  - Town of Cortlandville, Districts 1, 10, 12
  - Town of Homer, District 8
  - Town of Preble, Districts 2, 3
  - Town of Scott, Districts 2, 5, 6, 8, 9
- 2d supervisory district—Mrs. A. M. Shuler, district superintendent
  - Town of Cincinnatus, District 1
  - Town of Cuyler, District 9
  - Town of Truxton, Districts 6, 7, 14
- 3d supervisory district—Alice B. Greene, district superintendent
  - Town of Hartford, District 3

Delaware County

- 1st supervisory district—Lillian M. Reichard, district superintendent
  - Town of Tompkins, Districts 12, 14, 20
- 4th supervisory district—L. R. Long, district superintendent
  - Town of Middletown, District 8

Dutchess County

- 1st supervisory district—F. L. Haight, district superintendent
  - Town of East Fishkill, District 10*
- 2d supervisory district—F. E. Benedict, district superintendent
  - Town of LaGrange, District 12*
  - Town of Poughkeepsie, District 8*
- 3d supervisory district—Clara E. Drum, district superintendent
  - Town of Amenia, Districts 3, 4*
  - Town of Clinton, Districts 1*, 2, 4*, 5, 6, 8*, 9*
  - Town of Hyde Park, Districts 3, 4*
  - Town of Stanford, Districts 1, 2*, 3, 4, 5*, 7, 9, 11*
- 4th supervisory district—W. Tremper, district superintendent
  - Town of Milan, District 10

Erie County

- 1st supervisory district—C. A. Heist, district superintendent
  - Town of Amherst, Districts 9, 17*
  - Town of Clarence, District 3
- 2d supervisory district—H. E. Dann, district superintendent
  - Town of Alden, District 6
  - Town of Lancaster, District 3*
- 3d supervisory district—W. E. Pierce, district superintendent
  - Town of Aurora, Districts 3*, 10*, 11*
  - Town of East Hamburg, Districts 2*, 4*, 5*, 7*, 11*
  - Town of Elma, Districts 1, 7*, 10
  - Town of Marilla, Districts 2, 3, 6*, 9*
  - Town of Wales, Districts 2*, 5*
- 5th supervisory district—W. E. Bensley, district superintendent
  - Town of Boston, District 4*
  - Town of Colden, Districts 3*, 8, 9*, 10*
  - Town of Concord, Districts 2, 12*
  - Town of Holland, District 1

Essex County

- 2d supervisory district—Gertrude M. Spear, district superintendent
  - Town of Willsboro, District 5
- 3d supervisory district—Mattie J. Prime, district superintendent
  - Town of Jay, Districts 6, 10
  - Town of Wilmington, District 3*

Franklin County

- 1st supervisory district—E. L. Moe, district superintendent
  - Town of Burke, Districts 7, 16
  - Town of Malone, Districts 4*, 9, 15*
- 3d supervisory district—F. H. Wilcox, district superintendent
  - Town of Westville, District 1*
- 4th supervisory district—Gertrude E. Hyde, district superintendent
  - Town of Bombay, Districts 4, 8
  - Town of Moira, District 10

Fulton County

2d supervisory district—C. E. VanBuren, district superintendent
Town of Perth, Districts 6, 8

Genesee County

1st supervisory district—E. M. McCullough, district superintendent
Town of Alabama, District 10*
Town of Batavia, District 7*
2d supervisory district—T. A. Clement, district superintendent
Town of Pavilion, District 1*

Greene County

1st supervisory district—T. C. Perry, district superintendent
Town of Cairo, Districts 4*, 7*
Town of Catskill, District 12
2d supervisory district—R. M. MacNaught, district superintendent
Town of Greenville, District 9*

Hamilton County

1st supervisory district—Charles Hanley, district superintendent
Town of Hope, District 5

Herkimer County

1st supervisory district—A. J. Rose, district superintendent
Town of Litchfield, District 9
3d supervisory district—C. B. Keller, district superintendent
Town of Herkimer, District 2

Jefferson County

1st supervisory district—C. M. Pierce, district superintendent
Town of Ellisburg, District 4
3d supervisory district—T. B. Stoel, district superintendent
Town of Clayton, District 23

Lewis County

1st supervisory district—Ursula T. Marilley, district superintendent
Town of Watson, Districts 4, 9
3d supervisory district—Ruth M. Johnston, district superintendent
Town of Greig, Districts 1, 2

Livingston County

2d supervisory district—J. F. Smith, district superintendent
Town of Conesus, District 2*
Town of Livonia, District 5*
Town of Sparta, District 8
Town of Springwater, District 10*
3d supervisory district—H. F. Collister, district superintendent
Town of Portage, District 1

Madison County

1st supervisory district—J. S. Sears, district superintendent
Town of Brookfield, District 12
2d supervisory district—C. J. Wrattan, district superintendent
Town of Cazenovia, Districts 9, 12
Town of DeRuyter, District 3*
Town of Fenner, District 8
Town of Nelson, District 1
3d supervisory district—H. C. W. Kingsbury, district superintendent
Town of Eaton, District 2
Town of Madison, Districts 2, 8, 11, 13, 14
4th supervisory district—Daniel Keating, district superintendent
Town of Lenox, Districts 2, 3*
Town of Lincoln, Districts 1, 2*
Town of Oneida, Districts 2*, 7
Town of Sullivan, Districts 4, 6, 10, 11, 15*, 18

Monroe County

1st supervisory district—W. W. Rayfield, district superintendent
Town of Brighton, Districts 1, 9
Town of Henrietta, Districts 2, 4*, 5*, 6, 7*, 8*, 9*
Town of Irondequoit, Districts 2, 4, 5
Town of Penfield, Districts 2*, 3*, 5*, 7, 8, 9*, 10
Town of Webster, Districts 3*, 4, 9*
2d supervisory district—M. B. Furman, district superintendent
Town of Mendon, Districts 1*, 2*, 2*, 3, 4*, 6*, 9*, 11*, 12, 13*, 14*, 15, 16*
Town of Perinton, Districts 1*, 4*, 5, 6*, 10*, 11*, 12*, 13*
Town of Pittsford, Districts 2, 3, 4, 5*, 7*, 9*
Town of Rush, Districts 1*, 3*, 4*, 5, 6*, 9*, 10*

Monroe County (*continued*)

3d supervisory district—F. W. Hill, district superintendent
Town of Clarkson, Districts 2*, 6*, 9, 10
Town of Greece, Districts 6*, 11, 13
Town of Hamlin, Districts 4*, 6, 10, 13, 14, 15*
Town of Parma, Districts 9, 10, 11*
Town of Sweden, Districts 1*, 3, 8

4th supervisory district—J. C. Malloch, district superintendent
Town of Chili, District 7*
Town of Gates, Districts 1*, 7*
Town of Ogden, Districts 3*, 4*, 7*, 10, 11*, 12
Town of Riga, Districts 1*, 2*, 5, 6*, 8*, 10*
Town of Wheatland, Districts 4*, 5*

Montgomery County

1st supervisory district—N. B. Alter, district superintendent
Town of Canajoharie, Districts 7, 8*, 10
Town of Minden, Districts 6, 11, 13, 16
Town of Palatine, District 7
Town of Root, Districts 2, 3*, 4*, 5, 6*, 10

2d supervisory district—Mrs. Lela G. Dodge, district superintendent
Town of Amsterdam, Districts 7, 10
Town of Charleston, District 3
Town of Florida, Districts 3, 14
Town of Glen, Districts 1*, 5
Town of Mohawk, Districts 2, 7*, 10, 11

Nassau County

1st supervisory district—J. S. Cooley, district superintendent
Town of North Hempstead, District 1

Niagara County

1st supervisory district—J. S. Cramer, district superintendent
Town of Hartland, Districts 4, 5*, 6, 8*, 9*, 12*, 18*
Town of Royalton, Districts 3*, 12, 13*, 20, 21, 25
Town of Somerset, Districts 4*, 5*, 8, 10, 11*, 13*

2d supervisory district—Orrin A. Kolb, district superintendent
Town of Cambria, District 2

3d supervisory district—W. D. Wisner, district superintendent
Town of Lewiston, District 7*
Town of Newfane, Districts 1*, 6, 7, 10*, 12*, 15*
Town of Porter, District 9*
Town of Wilson, Districts 2*, 13*

Oneida County

1st supervisory district—R. P. Snyder, district superintendent
Town of Deerfield, District 2
Town of New Hartford, District 10

3d supervisory district—W. J. Lewis, district superintendent
Town of Vernon, District 2
Town of Westmoreland, Districts 4, 13

4th supervisory district—F. E. Mathewson, district superintendent
Town of Rome, Districts 8*, 10, 12
Town of Verona, Districts 11, 14, 15*
Town of Vienna, Districts 1*, 6, 9, 15*

6th supervisory district—Pauline L. Scott, district superintendent
Town of Camden, District 4

Onondaga County

1st supervisory district—R. B. Searle, district superintendent
Town of Onondaga, District 22

3d supervisory district—E. E. McDowell, district superintendent
Town of Cicero, District 4
Town of Clay, District 15

4th supervisory district—M. D. Green, district superintendent
Town of Van Buren, District 1*

Ontario County

1st supervisory district—L. J. Cook, district superintendent
Town of Canandaigua, Districts 2, 8*, 15*
Town of East Bloomfield, Districts 6*, 7*, 9*

2d supervisory district—W. A. Ingalls, district superintendent
Town of Farmington, Districts 3*, 11*, 12*
Town of Manchester, District 4
Town of Phelps, District 20

3d supervisory district—E. S. Soper, district superintendent
Town of Geneva, Districts 5*, 7*
Town of Gorham, Districts 8, 11, 13*, 16*
Town of Hopewell, District 6*
Town of Seneca, Districts 1*, 6*, 7*, 11*, 12*, 13*

Orange County

2d supervisory district—O. Eichenberg, district superintendent
Town of Warwick, District 13*

Orleans County

1st supervisory district—Luella P. Hoyer, district superintendent
Town of Ridgeway, District 1*
Town of Shelby, Districts 1, 13*
2d supervisory district—Cora V. Luttenton, district superintendent
Town of Barre, Districts 10*, 13

Oswego County

1st supervisory district—Mrs. Mildred G. Pratt, district superintendent
Town of Boylston, Districts 2, 3, 5
Town of Orwell, District 4
Town of Sandy Creek, Districts 1, 6, 12, 13
2d supervisory district—J. M. Bonner, district superintendent
Town of Albion, Districts 2, 13
Town of Parish, Districts 4, 9, 13
Town of Richland, Districts 3, 5, 17
3d supervisory district—Queenia R. Tooley, district superintendent
Town of Amboy, Districts 1, 2, 3, 7
Town of Constantia, District 2
Town of Hastings, Districts 2, 5, 8, 9, 12, 15, 16
Town of Schroeppel, Districts 3, 5, 6, 8, 10, 14
Town of West Monroe, Districts 6, 7
4th supervisory district—C. I. Kingsbury, district superintendent
Town of Mexico, Districts 1*, 2*, 3, 4, 5, 7*, 8, 9*, 10, 11, 12, 13*, 14, 15, 16*
Town of New Haven, Districts 1*, 2, 3, 4, 5, 6, 7, 8*, 9, 10, 11, 12
Town of Palermo, Districts 1, 2, 3, 4*, 5, 6*, 7, 8, 9, 10, 11, 13*
Town of Scriba, Districts 1, 2* 3*, 4, 5*, 6, 7, 8, 9*, 10, 11, 12, 13, 14, 15, 16*, 17, 18
5th supervisory district—W. G. Gardner, district superintendent
Town of Granby, Districts 1, 4, 8, 10, 12
Town of Hannibal, Districts 5, 6, 11, 14
Town of Oswego, Districts 2, 5, 8, 10, 11, 13
Town of Volney, Districts 6, 7, 8*, 9, 12

Otsego County

1st supervisory district—H. Cossaart, district superintendent
Town of Middlefield, District 2
2d supervisory district—M. Burlingame, district superintendent
Town of Maryland, Districts 5, 7
Town of Westford, District 8
3d supervisory district—J. B. McManus, district superintendent
Town of Exeter, District 5
Town of Hartwick, Districts 1, 6, 13
Town of Otsego, Districts 2, 6, 8, 9, 10, 17
5th supervisory district—M. R. Porter, district superintendent
Town of New Lisbon, Districts 6, 11*, 13
6th supervisory district—F. R. Thayer, district superintendent
Town of Burlington, Districts 2, 4, 5, 9, 12
Town of Edmeston, Districts 3, 6*, 11
Town of Pittsfield, Districts 3, 12

Rensselaer County

1st supervisory district—Mrs. C. B. Clark, district superintendent
Town of Brunswick, District 3
Town of Hoosick, Districts 12*, 13, 18*
Town of Pittstown, Districts 3*, 4*, 10*
Town of Schaghticoke, District 3*
2d supervisory district—C. H. Maher, district superintendent
Town of Berlin, Districts 3, 9
Town of Grafton, Districts 2, 8*
Town of Petersburg, District 6
Town of Poestenkill, Districts 1, 2, 3, 4, 5*
Town of Stephentown, District 3*
3d supervisory district—G. W. Patterson, district superintendent
Town of North Greenbush, District 1*

Rockland County

1st supervisory district—George W. Miller, district superintendent
Town of Ramapo, District 10*

St. Lawrence County

5th supervisory district—Rose M. Libby, district superintendent
Town of Canton, District 20
7th supervisory district—M. A. Hallahan, district superintendent
Town of Brasher, District 13

Saratoga County

1st supervisory district—A. A. Lavery, district superintendent
Town of Clifton Park, District 13*
Town of Malta, Districts 1, 7*
Town of Stillwater, Districts 5*, 9

Saratoga County (*continued*)
- 2d supervisory district—Lou Messenger, district superintendent
  - Town of Ballston, Districts 1, 4*, 6, 10
  - Town of Charlton, Districts 1, 7*, 9*
  - Town of Solway, Districts 10, 12, 15
  - Town of Milton, Districts 2*, 3, 4, 6*, 9*, 12
- 3d supervisory district—E. E. Hinman, district superintendent
  - Town of Moreau, Districts 2*, 3, 6, 7, 8, 9*, 11
  - Town of Northumberland, Districts 1*, 2*, 3, 5, 6*, 7*, 9*
  - Town of Saratoga, Districts 2*, 3, 4*, 5*, 7*, 9, 11
  - Town of Saratoga Springs, Districts 2, 4, 6, 7, 8
  - Town of Wilton, Districts 1*, 3, 4, 5, 6, 7*, 8*
- 4th supervisory district—Ida M. Smith, district superintendent
  - Town of Corinth, Districts 3, 4
  - Town of Day, Districts 1, 4, 7
  - Town of Edinburg, Districts 4, 8, 10
  - Town of Greenfield, Districts 3, 6, 8, 9, 13, 16*, 17
  - Town of Hadley, Districts 6, 7

Schenectady County
- 1st supervisory district—James Wingate, district superintendent
  - Town of Princetown, District 5
  - Town of Rotterdam, District 5

Schoharie County
- 2d supervisory district—W. Van Wormer, district superintendent
  - Town of Esperance, District 1
  - Town of Fulton, District 11
  - Town of Middleburgh, District 5*
  - Town of Schoharie, District 6
  - Town of Wright, District 10
- 3d supervisory district—R. W. Eldredge, district superintendent
  - Town of Carlisle, District 11
  - Town of Richmondville, District 7
  - Town of Sharon, District 6

Schuyler County
- 1st supervisory district—Alberta Spaulding, district superintendent
  - Town of Hector, Districts 8, 15*
- 2d supervisory district—Jane Haring, district superintendent
  - Town of Reading, District 4*

Seneca County
- 1st supervisory district—Alice Owen, district superintendent
  - Town of Lodi, District 8
  - Town of Romulus, District 4*
  - Town of Varick, District 6
- 2d supervisory district—C. B. Earl, district superintendent
  - Town of Fayette, Districts 1*, 3*, 10*, 14*, 16*
  - Town of Junius, Districts 1*, 3*, 4*, 7
  - Town of Seneca Falls, Districts 2*, 4
  - Town of Tyre, Districts 4*, 5*
  - Town of Waterloo, Districts 3, 4*

Steuben County
- 1st supervisory district—L. R. Tubbs, district superintendent
  - Town of Corning, District 6
  - Town of Lindley, Districts 3*, 6, 10
  - Town of Tuscarora, District 10
- 2d supervisory district—W. Morrow, district superintendent
  - Town of Bath, District 12
- 3d supervisory district—G. H. Guinnip, district superintendent
  - Town of Addison, District 3
  - Town of Woodhull, District 11
- 4th supervisory district—F. C. Wilcox, district superintendent
  - Town of Jasper, District 7
- 5th supervisory district—H. M. Brush, district superintendent
  - Town of Canisteo, Districts 2, 4, 5 6, 7, 10
  - Town of Dansville, Districts 2*, 5, 7, 10, 11, 15*, 16*
  - Town of Fremont, Districts 3, 5*, 9*
  - Town of Hartsville, Districts 3, 4, 5*, 7
  - Town of Hornellsville, Districts 4, 10, 12*
- 6th supervisory district—G. J. Carter, district superintendent
  - Town of Avoca, District 1*
  - Town of Cohocton, District 7
  - Town of Howard, District 13
  - Town of Wayland, Districts 2, 6*

Suffolk County
- 1st supervisory district—C. H. Howell, district superintendent
  - Town of East Hampton, District 2*
  - Town of Riverhead, District 4*
  - Town of Southampton, Districts 8*, 13*, 17*
  - Town of Southold, District 14*

Sullivan County

2d supervisory district—C. S. Hick, district superintendent
Town of Callicoon, Districts 1*, 3*, 4
Town of Delaware, District 3
Town of Fremont, District 10
Town of Neversink, District 11
Town of Rockland, District 8

Tioga County

1st supervisory district—A. E. Belden, district superintendent
Town of Candor, Districts 6*, 15
2d supervisory district—M. D. Goodrich, district superintendent
Town of Barton, District 14
Town of Spencer, District 1*
Town of Tioga, Districts 2*, 5, 12, 13, 15*
3d supervisory district—H. T. Whittemore, district superintendent
Town of Nichols, Districts 4*, 5

Tompkins County

1st supervisory district—F. H. Beardsley, district superintendent
Town of Enfield, District 2
Town of Newfield, Districts 1*, 3*, 5*, 10, 18*
Town of Ulysses, Districts 11*, 15
2d supervisory district—Mrs. H. K. Buck, district superintendent
Town of Groton, District 2
Town of Ithaca, Districts 1*, 8*
Town of Lansing, Districts 6*, 15*, 16
3d supervisory district—J. D. Bigelow, district superintendent
Town of Caroline, Districts 3*, 7, 12*, 14, 15, 16, 17, 18*, 19, 21
Town of Danby, Districts 1, 5*, 6*, 8, 9, 10, 11*, 12*, 14, 15, 16
Town of Dryden, Districts 1*, 2*, 3, 4, 5, 7, 9*, 10*, 13, 14, 15, 18, 20, 23*, 24, 25

Ulster County

1st supervisory district—Emily Burnett, district superintendent
Town of Rosendale, District 6
Town of Saugerties, District 15*
2d supervisory district—J. U. Gillette, district superintendent
Town of Gardiner, District 6*
3d supervisory district—J. M. Schoonmaker, district superintendent
Town of Rochester, District 13*

Warren County

1st supervisory district—F. F. Gunn, district superintendent
Town of Luzerne, Districts 5*, 7
Town of Queensbury, Districts 6*, 12, 15*, 16, 17*, 19

Washington County

1st supervisory district—Amelia Blasdell, district superintendent
Town of Whitehall, District 17
2d supervisory district—Myra Ingalsbe, district superintendent
Town of Kingsbury, Districts 9*, 15
3d supervisory district—Mary Potter, district superintendent
Town of Easton, Districts 9*, 15*
4th supervisory district—F. H. Rich, district superintendent
Town of Cambridge, Districts 4, 5*
Town of Jackson, Districts 3, 9*
Town of Salem, Districts 7, 8*, 15
Town of White Creek, Districts 1*, 4*, 6*, 7, 13

Wayne County

1st supervisory district—Mrs. H. Andrews, district superintendent
Town of Arcadia, Districts 3*, 4*, 10*, 11*, 12*, 13*, 15*, 16*, 19*
Town of Galen, Districts 2*, 3*, 5*, 6*, 8*, 10, 11*, 13*, 15, 17*, 18*, 19*
Town of Lyons, Districts 1*, 8, 11, 14*
Town of Savannah, Districts 1*, 3*, 4*, 7*, 11*
2d supervisory district—Mrs. Ida Cosad, district superintendent
Town of Butler, Districts 7, 9*, 10*, 12*, 13*
Town of Huron, District 5
Town of Rose, Districts 5*, 8, 11*, 12*
Town of Wolcott, Districts 7*, 9*, 12*
4th supervisory district—R. O. Brundige, district superintendent
Town of Sodus, District 21

Wyoming County

2d supervisory district—E. D. Jones, district superintendent
Town of Bennington, District 17
3d supervisory district—G. A. Stratton, district superintendent
Town of Covington, District 9*

Yates County
- 1st supervisory district—J. T. Bullock, district superintendent
  - Town of Benton, District 8*
  - Town of Starkey, District 3*
  - Town of Torrey, District 5*
- 2d supervisory district—E. P. Corbit, district superintendent
  - Town of Italy, District 9

Unknown, 1

Schools sending one type	536
Schools sending both types	360
Total schools represented	896
Total number of ears	1,256

THE GENERAL EXHIBIT FOR FARMERS' WEEK

Last year many of our boys and girls sent good contributions to the rural school exhibition held at the New York State College of Agriculture during Farmers' Week. There were natural history specimens, collections of weed seeds, collections of woods, specimens of sewing, and many other things that helped to show some of the work that our rural schools are doing. Farmers from all over the State were interested in this exhibit, and many educators who came here to learn what is now being done by rural schools were impressed by the painstaking exhibitions that came from some of our small rural schools. We were very proud of this exhibit, and we hope that this year we shall have a larger one.

One difficulty in taking care of the exhibit last year was due to the fact that some schools sent a great box of material of similar nature. This year we hope you will look over your exhibit material very carefully, and select the best specimen from each of the classes given below. We do not want you to send anything that you consider of so much value that you would be greatly disturbed if it should be lost. When we have thousands of mounts it is not an easy matter to take care of each one.

We hope that your school will look over every one of the classes mentioned for the exhibit, and send at least one contribution. We should not like to feel that your school was not represented. You have an opportunity to send thirteen exhibits, but we do not want more than *one* from each class, as follows:

1. One mount of tree specimens.

2. One bird's nest well mounted, with description and drawing of the species of bird to which it belonged.

3. One mount of poultry feathers, accompanied by such description and information regarding these feathers as will present the knowledge gained by the study of them.

4. One collection of herbaceous plants, collected and mounted by the children. This should be prepared by the school for a school prize.

5. One mount of grains or grasses, with informational matter that will show knowledge of the specimens mounted. The mount to be prepared by the school, not by an individual.

6. One drawing of natural scenery.

7. One drawing of farm animals.

8. One bird calendar.

9. One weather record.

10. One sample of stocking darning.

11. One sample of napkin hemming.

12. One kitchen apron for a girl twelve to fourteen years of age, which will be judged as to suitability of material, color, design, and workmanship.

13. One attractive and serviceable bureau cover.

Do not wait too long to get your work ready, and be sure that you send it not later than January 31, 1915. Perhaps your school will be the one to get the blue ribbon for at least one class of entries. We know you will take great satisfaction in finding that your school, in competition with hundreds of others, has done a piece of work of high grade.

THE LETTER BOX

Every day some boy or girl in your school makes a discovery on the farm or along the wayside that we should like to hear about. We should also like to know of all new plans that you may be making. For this reason we want you to make a letter box for the schoolroom, and put into it letters for Mr. Tuttle whenever you have learned something new or when you have started an experiment of any kind. When the box is filled, perhaps your teacher will mail the contents to us. Remember that every communication will be read, even if each letter is not answered personally. Always be sure to give your district number and township.

What will you write about? Anything that is interesting to you will be of interest to us. Perhaps some of the subjects will be as follows:

1. What did you do out of doors last summer?

2. Did your school prepare an exhibit for the county fair?

3. How are you going to spend the money that you won in premiums?

4. Have you taken any field trips this fall? If so, describe one of them.

5. What are your plans for Corn Day?

6. How did your garden turn out? Did you try to follow the plan in the March leaflet?

7. Have you begun the weed study, and what are your plans?

8. How did your school celebrate Hallowe'en?

9. Tell about the Christmas exercises.

10. What improvements have been made in your school building this year? What part did you take in them?

11. What has been done to improve the grounds?

LETTER TO GIRLS AND BOYS

Dear Girls and Boys:

November is here, and with it the opportunity to write to you again. There is much to say, for it is a long time since my last letter in March. Spring and summer have come and gone, and autumn is well along. Thanksgiving is near at hand and Christmas will soon be here.

You all can remember the closing weeks of school in May and June. The earth was alive with growing things, the air was sweet and fresh, and you could feel the pulse of summer. You remember Arbor Day, and what you did to improve the school grounds, cleaning up, and perhaps planting a tree or a shrub or a flower bed. You remember the trips to the woods and fields taken with the teacher, and the new things that were learned about the birds, the trees and flowers, and the wild animals and insects. I hope that you had several such trips, and that this fall you have been out again observing nature at another season — the season of the harvest.

You remember, also, the last day of school and the little picnic together before disbanding for the vacation months. You were sorry to leave, for it had been a pleasant year, yet you looked forward to the long summer days at home. Letters have already come to me telling what some of you did during the vacation time. One boy kept a fine flock of poultry; another took care of the horses and helped to train a colt; another assisted in the general farm work, preparing the soil, sowing and planting, haying, reaping, threshing, and all the round of farm labor. The girls have been keeping bees, and raising calves, washing dishes, making beds, learning to cook and to sew and to keep a home neat and clean. Both boys and girls have had gardens, and many tried to follow the plan given in the March leaflet. I had a garden on this plan, also, and learned much that was new and interesting. In a later leaflet we shall talk more about this, and I hope every one who tried the plan will write me about it because next year we must make it better.

The vacation has not been all work, and you have had good times out of doors in the fields and woods, on the roads and by-paths, along the streams and edges of ponds, singing, whistling, fishing, swimming, running, jumping, playing; all the while breathing the pure, fresh air, and watching and listening for something new to learn about the wild things.

Now you are in school again, and this is the first leaflet for the year. I hope you will enjoy it. Read "Christmas on the Farm" on page 1026. Last year you remember we wrote to you about Thanksgiving Day. We have also outlined in this leaflet a number of things for you to do in studying horses, birds, plants, and trees for this year. Your teacher will help you with this work.

You will be interested to read over the article about Corn Day on page 1005, and to see the list of all the schools that sent ears of corn for the Farmers' Week exhibit last year. What a lot of them there were! This year I expect there will be twice as many schools sending corn, for it

Some of the members of a school visited in October, 1913. On the field trip several chestnut trees were found

has been a good crop year and I am sure you will be able to select plenty of fine ears. Ask your teacher to read from her September leaflet what we say about Corn Day; you will find there also a list of the schools winning prizes for the best ears from each county, and for the State. Two years ago the state prizes went to schools in Cayuga and Washington Counties. Last year they went to schools in Monroe and Niagara Counties. Where will they go this year? Have a good Corn Day on December 4, and send us the best ears of corn according to the directions given in the article on page 1005.

I want especially to ask you to read the note on page 1003 about the collection and identification of weed seeds. You can find many weed seeds now, and I hope you will learn a lot of them this fall. In the next leaflet

we shall publish a letter from a rural school telling of some seed testing work that was done for the farmers in the neighborhood. This is interesting and valuable work, and in the next few years we expect that many schools will take it up. In order to do good work with the testing, you must be familiar with weed seeds that you will find in the farm seeds, and be able to tell whether or not they are serious weeds and dangerous for the farmers to plant. So begin to collect and study the weed seeds now, and be ready for the work on seed testing in the January leaflet.

We are trying to find out how many egg clusters of the apple-tree tent caterpillar were destroyed by the schools last year. We asked the teacher to send us a report on the blank on which she sent in your names for the leaflets early in the year. If she did not do this, and you have a report to make, send it to us now. In the January leaflet we shall tell you the result, and I think every one will be surprised. Of course the tent caterpillars are not all gone. There are plenty of egg clusters again this fall, and I expect to hear from many of you that you have been keeping up the good work.

Since last spring I have met and talked with some of you. In May I spent three days in Ontario County and visited six schools; in June there was a school field day in Erie County, and we had a good time although it rained; in September I attended four school fairs in Otsego County; and last month I was in Delaware County for three days to see some exhibits of school and contest work. We can never tell when we may see each other, and when we do I hope you will not hesitate to tell me what you are doing and of the things that interest you. There are so many of you that I cannot possibly learn all your names and faces, but I am always happy to have you speak to me, and we shall be better friends afterward.

Your letters are coming in large numbers and I am interested to read them all. It is a pleasure to find that almost always you remember to put the district number and the name of the township and of the county at the top of the letter. I am glad, also, that so many of you are writing to me from home as well as from school. This makes me feel that at home you are still interested in the school, and in the school you do not forget the home. Last year about two thousand boys and girls wrote three letters and received the gift picture that we sent, and many others wrote once or twice. This letter in the leaflet is my message to you, although sometimes I find time to write personal notes to those who send me especially good letters. Write as often as you care to. Your letters will be read and credited toward the picture, and I shall be glad to hear of all that you are doing.

Your friend,

Edward M. Tuttle

LETTERS FROM BOYS AND GIRLS

District 8, Town of Cuyler, Cortland County
Cuyler, New York, December 11, 1913

Dear Mr. Tuttle:

I have read your letters in the leaflet and I like them very much. There is snow on the ground that is knee-deep. I am a boy twelve years old. I live on a farm. The house I live in is on a knoll like, and it is quite steep to go down from the barn to the level, and in the winter I slide down hill and I go fast and far. I like the snow and like to play in it. I have thought when I am older I will go to Cornell or Yale. We received your leaflets not long ago. I am in the sixth grade and have to study hard. My teacher's name is E. Pearl Case, her home is in Cuyler. Our R. F. D. is No. 2.

There are four stores in Cuyler. The little settlement I live in is Tripoli. We have slate blackboards; not wooden. I like nature study. We have been studying the elm tree. Our school is on a hill a mile and a half from Cuyler. There are twelve scholars here in this school. At home we have five canaries. This morning at breakfast one of the canaries looked at me with one black bead-like eye, and then with the other. He looked so cunning I laughed to myself when I saw him.

On the farm where I live we have three horses, thirty cows, three pigs, six puppies, an old shepherd dog, and nine calves. Mrs. Shuler is our district superintendent. On Corn Day we had a yell. It was:

" Who are we? . Who are we?
District 8, can't you see?
How do we work? How do we work?
With a will, and never shirk.
What do we do? What do we do?
Read, write, spell, and grow corn, too.
What will we be? What will we be?
Good men and women, brave and free.
Who are we? Who are we?
District No. 8. Now do you see?"

Sincerely yours,

ELLWYN LEWIS

District 11, Town of Seneca, Ontario County
Seneca, New York, January 22, 1914

Dear Mr. Tuttle:

It is our pleasure to write you letters to-day, taking the regular class time to do so, and to let you know Miss Moore was ill and our school was closed early, or we should have sent you our Christmas greeting as usual.

On December 5 we celebrated Corn Day in our school; in the morning we had our regular classes and we took the afternoon to celebrate and play. We had a good time; we girls played out of doors while the boys popped corn. We chose sides and tried how many words we could make out of "Corn Day," and counting the words on both sides we had about sixty words.

We are very sorry that we must send such poor ears to the College, but they were the very best in our exhibit, as there was no real good corn here this year.

A boy lettered the label for one car, and a girl lettered the other label.

Hoping the new leaflets will soon reach us, I remain,

Your friend,

P. S. MARY E. CONRAY

Mr. Tuttle came not our way –
So we must *write* what we would *say*
To tell him of our work and play,
And how we spent our Corn Day.
We called them all out in the play—
Dan, Nora, Dora, and little Ray;
Let others say just what they may—
There's lots of fun in "Corn Day."

By the Seneca Sharp Eyes

District 10, Town of Springwater, Livingston County

Springwater, May 19, 1914

Dear Mr. Tuttle:

I live one mile from our schoolhouse. It makes a fine walk spring days when the birds are singing and the flowers are in bloom.

Our schoolhouse is near the road and we certainly have a fine view of the surrounding country. A brook runs near our playground, and so, of course, we have a great deal of enjoyment out of it.

My greatest point in writing this letter is to acknowledge the prize that our school won this year. We were awarded first prize for Livingston County for our corn at Farmers' Week. Imagine our delight when the ear came back with a nice blue ribbon around it and a very nice letter to us all. We all thank you very much for it.

Another thing I want to speak about is our walk to the woods Arbor Day. Miss Brown, our teacher, and the rest of the pupils, went to some woods quite a long way from our school. But at last we reached them, and lo! the woods were just covered with white and red lilies. What a pretty sight! We gathered some very large bouquets of flowers, studied nature, and had a delightful time.

We expect to have a picnic or other doings the last day of school, which will be the 29th of May.

I must close for this time.

Sincerely yours,

MILDRED E. JOHNSON

Editors' note—The letters from Ellwyn, Mary, and Mildred show the spirit of Corn Day. Other schools will be interested in them. Each year Corn Day seems to grow better and better; there is more enthusiasm, the older folk help more, and the ears of corn selected are better in quality. It is fine work.

We enjoyed the verses sent by the Seneca Sharp Eyes, and since they were written Mr. Tuttle has visited the school and spent an afternoon with these wide-awake boys and girls.

A good rural school exhibition

In addition to or in connection with Corn Day, many schools are holding general exhibitions like the one in the picture on this page. We recently attended such an exhibit in a school of twelve pupils and were greatly interested in the effort that had been made to select good specimens and to arrange them attractively. At such exhibitions some older person who has the knowledge should judge the products and tell why he judges as he does, so that all may learn how to do better the next time a fair is held at the school.

District 7, Town of Hounsfield, Jefferson County
Watertown, New York, February 26, 1914

Dear Mr. Tuttle:

I read your leaflet and like it very much. I am in the ninth grade and am fourteen years old. My favorite studies are German and algebra. My teacher's name is Isabel McAvoy. We like her very much. She lets us bring cats and dogs or anything we like to school.

Three of us boys are building a house in the woods just back of the schoolhouse. In this we are going to make maple sugar and sell it. The house is made from old boards which we got from an old barn. It is about nine feet square and seven feet high. The teacher gave us fifty cents, and we are going to get tar paper with it for the roof. We have the door on the south and a sort of little porch, so when it rains we can boil sirup under that. There are about fifteen maple trees near it. Another boy and I are going to stay there most of the time. We build on our house noons. When it is time for us to come the teacher calls us from the fence.

Our school is the best country school and yard in the county. It has twenty-seven trees in the yard. The well and flagpole are in front of the schoolhouse about three rods from the building. There are 191,440 square feet in the yard.

I have a dog, five cats, bantams, a colt, cows, and a pig. My father has a big farm and has all kinds of animals. He always teaches me to be kind to them. He gave me a cow when I was six years old, and her calves have always been mine. Last fall one cow died. I sold two and have one left. The colt is three years old. She can trot very fast and I was offered $175 for her when she was a year and a half old, but I thought I might as well have a good horse as my father. He laughs and says he will beat me in a race some day, but I don't think he will. My chores are to take care of the horses, of which there are five. I like to do this.

Well, as this is my first letter I will close, but will write again and tell you about sugaring and other things.

Your friend,

NEWMAN J. HAMBURG

Editors' note.—Newman has written a good letter, full of things to think about. He loves the country, likes his school life and his home life, and finds plenty of interesting and useful things to do in both school and home. His favorite studies are those that very often are troublesome. He is using his recess to help build a shanty near the school where he and his friends can have some outdoor experiences. Boys like such things. He is proud of his school, and no doubt helps to keep it neat and attractive. At home Newman has a real part in the farm life, does his share of the work, and has been rewarded for his faithfulness by having animals given him to bring up for himself.

District 9, Town of Otsego, Otsego County
Cooperstown, New York, January 28, 1914

Dear Mr. Tuttle:

I have been looking over one of the Cornell leaflets, and saw that children from different schools have written to you and told about their schools; so I am going to write and tell you about the many improvements which have been made in the past two years at our school.

Two years ago our schoolhouse was situated on the opposite side of the road. It was about three yards from the road. We had no school grounds, so we had to play in the road and by the roadside. Inside of our schoolhouse there were twelve double seats which were full of carvings. The walls were not painted, the plaster was loose, and ink stains were on the desks, floors, and ceiling. We had an old stove and board blackboards, which were battered by boys throwing knives at them and trying to hit a mark which they put there.

Now our schoolhouse is moved on the other side of the road. It is newly painted a white color, and there are cement steps, and a gravel walk from the steps to the road. There is a half-circle road which leads up to the back door, where teams may drive when children are brought to school in bad weather. The pupils always enter the schoolroom by the back door. We have about half an acre for playground. Next summer we are going to have some shrubbery set out on each side of our walk, and some shade trees. Also we girls are going to have a nice flower bed. Inside of our schoolhouse we have a new stove, slate blackboards, new window shades, desks, recitation bench, and maps. Our school gave a school party from which we raised money enough to get a clock, a teacher's desk, a dictionary standard, and a bookcase. Our floor has been oiled and our schoolhouse looks very neat and nice.

Some of our schoolmates have some talent for drawing, and we have ever so many pictures on the wall. Some are from the first grade. We also have a few mottoes. One is "No backward steps," another is "Look up, not down." We have a picture which we all like very much; it is the "Horse Fair," by Rosa Bonheur. I have told you all about our school.

If you ever come up our way, I am very sure our school would enjoy having you visit us.

Sincerely yours,

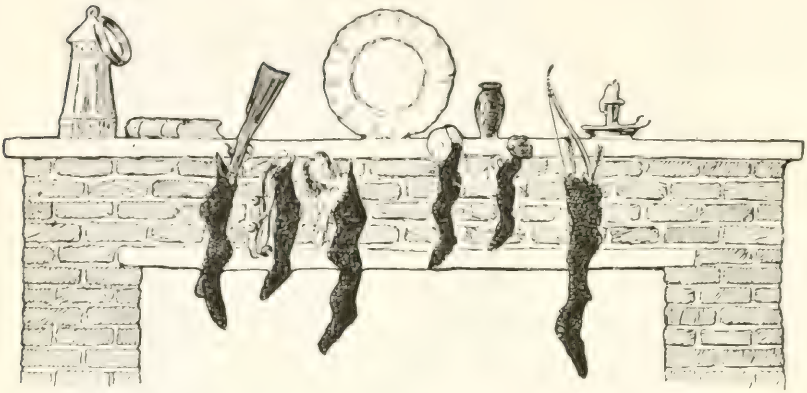
LOTTIE JANNETTE MCRORIE

Editors' note.—We were glad to hear of the many improvements at the school that Lottie attends, and we feel sure that she and her schoolmates are proud of the building and the grounds and will work hard to keep them clean and neat and unmarked. It is easier to study when one has such pleasant surroundings, and these boys and girls must be very happy in their school life.

PHOTOGRAPHED BY VERNE MORTON

Drop the handkerchief. What games do you play?

CHRISTMAS ON THE FARM



Let us suppose that all the boys and girls in the rural schools of New York State are sitting around the fireplace and planning for Christmas, the happiest of all times. Thanksgiving has gone, and now we must be ready for the next great day. Out in the country Christmas is more wonderful than anywhere else, and we all want to make the most of it. If we do not look ahead we may leave out some real joy that would be a great loss.

In the first place, we must all read again the story of the Christ child whose birth nearly two thousand years ago made such a powerful change in the world. Your teacher will read to you the story of the little child born in a stable at Bethlehem, who gave His life that the world might find truth and light. Through all the glad Christmas time, even the little children should remember that we are celebrating the coming into the world of One who taught for all time the great lesson of life.

Then we must ask the teacher, or the mother or father, to read to us "A Christmas Carol," by Charles Dickens, so that we may learn from one of the greatest writers of stories what the Christmas spirit means. As you listen you will all come to know and to love Tiny Tim, the little boy who has been very real to us for many a year. I hope that in every rural school in New York State there is a copy of this work, and that every year it may be read aloud as a part of the Christmas festival.

There should be plans for an entertainment at the school, with a Christmas tree of course. Every class should have the fun of going out into the woods with the teacher to get the tree, and there should be very great care in choosing it. A tree is always of value, and when one is cut down it should be taken from some place where it is least needed. Do not cut

down a tree that has the best conditions for growth. Take one so near to another that its loss will give a better opportunity for growth for the tree left than if both remained. Of two trees, always take the one that is the less thrifty.

While choosing the tree for the school, find one more that can be left where it stands, on which may be hung gifts for the birds. They will like to find suet, a ham bone, some seeds, and other food to their liking, on the early Christmas morning.

There should be a program at the school when the Christmas tree is ready, and all should contribute something to the entertainment. The following may be suggestive:

1. The singing of Christmas carols.

2. A composition on the festival of Christmas.

3. A talk by one of the pupils on the common evergreens in the neighborhood, and specimens of the trees shown. It will be interesting to tell where the trees grow; whether they are native; facts as to their uses; and the like. Which evergreen is best for Christmas trees, and why? Where the city folk get their Christmas trees.

4. A talk by one of the pupils on the Christmas dinner. What farm crops are available for the festival? What are purchased at the store that come from other places? Who will cook the dinner? In what ways can boys and girls help?

5. One of the girls might tell how to set the table for the Christmas dinner. What out-of-door things may be used for decoration, such as Christmas ferns, red berries, little brown cones on branches of hemlock, and the like?

6. A farmer in the neighborhood could give a talk on the growing and storing of vegetables and fruits that add to the Christmas festival, and how boys and girls can help in this farm work.

7. One of the mothers might tell of helpful contributions that young folk can make at the busy Christmas time.

8. Recitations suitable to the season and occasion, not forgetting "The Night before Christmas," which has made the hearts of little children beat joyfully for many years in the past, and will give pleasure for all the years to come.

9. A little play given by the children — a scene, perhaps, from Dickens' "Christmas Carol," closing with Tiny Tim's "God bless every one!"

10. A gift basket prepared for some one in the neighborhood who is ill or alone. This should be trimmed with evergreens and brightened by red berries if possible.

When the program is finished, it would be interesting to have refreshments consisting of nuts, apples, popcorn, and homemade candy.

What a good time you will all have as you help to make the school day a success, and prepare for the joys of the holiday at home! Then, when the long, happy day has passed, you will go to your own room, and perhaps

A district school in Oneida county

you will look out of your windows and see the wonderful night with starlight, or falling snow, or some other magical sight that is always out of doors in the country on winter nights. And at this time, with deep reverence of spirit you will again remember the Christ child.

Cornell Rural School Leaflet

FOR BOYS AND GIRLS

Published by the New York State College of Agriculture at Cornell University, B. T. Galloway, Director; George A. Works, Head of the Department of Rural Education. Entered as second-class matter at the post office at Ithaca, New York

ALICE G. McCLOSKEY and EDWARD M. TUTTLE, Supervisors and Editors

ARTHUR D. DEAN, C. H. TUCK, W. E. PIERCE, and G. F. WARREN, Advisers

Vol. 8 ITHACA, NEW YORK, JANUARY, 1915 No. 3

PHOTOGRAPH BY VERNE MORTON

And one shall never quite forget
    The voice that called from dream and play,
The firm but kindly hand that set
    Her feet in learning's pleasant way,—

* * * * * *

Hers is the sober summer noon
    Contrasted with your morn of spring;
The waning with the waxing moon,
    The folded with the outspread wing.

* * * * * *

And, when the world shall link your names
    With gracious lives and manners fine,
The teacher shall assert her claims,
    And proudly whisper, "These were mine!"

JOHN GREENLEAF WHITTIER

THE DISTRICT SCHOOL

From rural schools have come men and women who have made the United States prosperous and powerful in the world's history. In rural schools to-day are boys and girls who will add to the prosperity and the power of our great country. Every opportunity should be given to them for education that will fit them for country life or for city life. The school should be comfortable and attractive. There should be plenty of land around it for out-of-door experiments, for playgrounds, for planting that will give an approach to the school building that will dignify it, for a trembling poplar near the window to make music when breezes are about, for maples or elms that provide quiet and shade, for evergreens that give shelter to winter birds, and for crocuses and tulips that add a joyful note to the spring coloring, —all these things can be made a vital part of education.

Is your school comfortable, attractive, well heated? Are the grounds around it planted? Have you a place for farm crop or garden experiments? Are the outhouses so clean and well cared for that you would be willing at any time to have the trustee, your parents, or any one from the Department of Education inspect them? Is there a good library in the school? Are the walls well cared for, the windows clean, the doors and entrances in good repair? Have you individual drinking-cups? If there is no water jar, is there a dipper that will enable you to fill your cup without dipping a cup that has been used into the pail? Why should you avoid dipping such a cup into the pail? Is your stove jacketed as are some stoves in rural schools in order that the heat may be more evenly distributed throughout the room? Is the interior of your building free from clutter? Has it neat walls on which there are one or two good pictures simply but carefully framed? If you cannot answer "yes" to these questions your school is behind many others, and we know that you will want it to be among the best. Older folk, trustees, parents, and teachers, will help boys and girls to have many advantages when all work together to secure the best educational surroundings, particularly when pupils show appreciation of improvements. Tell us all about your school and be sure to write to us when anything has been done to make the building and grounds more serviceable and attractive.

SPECIAL STUDIES FOR WINTER

We have often heard boys and girls say that there is nothing in nature to study in winter. This is because everything is quiet, and because boys and girls sit around the fire so much more than they go out of doors. To many persons who love nature there is more wonder in winter than in summer. There are the great stretches of snow-covered fields, the wonderful greens of the pines and the hemlocks, the silent, cold, snow-capped mountains, the buried brooks, the drifted highways, the music of the winds, the frost pictures on the windows, the strange, weedy stalks that appear above the snow, the butterfly that comes out of its hiding place in the February thaw, and the sparkling starlight through the leafless branches of the trees — yes, nature in winter has rich stores for us.

Among the interesting sights and sounds that are a part of the out-of-doors these days, there are a few that we would like to have you find this year, and we shall ask you, therefore, to consider the following:

I. Be on the lookout for the snowflake, a winter bird. Ask your teacher to read to you the article written by Doctor Allen in the teacher's leaflet. Every person who has seen a flock of snowflakes will never forget the experience. Perhaps these birds will come into your neighborhood, and if you will look at the picture in the September leaflet and note the description, you will be sure to recognize them. In Doctor Allen's article you will learn something of the behavior of these birds in the winter fields, and this will help you also, because habits of birds are very important when we are trying to identify them. The suggestions given below will be useful to you in your study:

1. Look for a bird about the size of a sparrow, very white, traveling in a flock.

2. The snowflake is found in open weedy fields, often near the house, but preferably near the more open country.

3. Note the shape of the bird with its large head and shoulders and heavy bill. Is it a sparrow?

4. Look for the snowflake's tracks in the snow. Does it hop, as do the junco and the tree sparrow, or does it run?

5. Watch the flock as it rises from the ground or as it is about to alight, and see in what unison the birds turn or circle.

6. Do they ever alight on trees? On fences?

7. What other birds do not alight in trees?

II. The bluebird sometimes arrives in New York State in February; be on the lookout for it.

III. We want you to be sure to have a feeding station in the winter-time because then the birds need it most. Your teacher will perhaps let

you read the article in her leaflet so that you will not forget the things that may be done in order to make the birds comfortable and happy.

IV. This is the time to build a bird house. The following description written by Doctor Allen will give you instructions as to what to do:

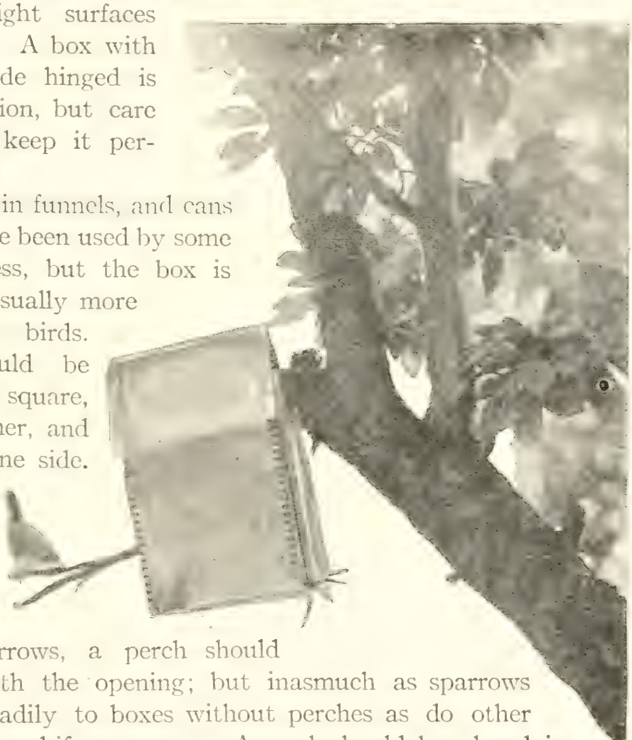
" Some birds, notably wrens and bluebirds, will avail themselves of anything in the way of shelter you see fit to put up; while others, such as woodpeckers and nuthatches, are more particular and require something more natural in the form of a hollow limb. The chief difficulty will be not in the construction of the boxes nor in attracting the birds, but in keeping out the English sparrows. These interlopers are ever present and ready to begin building as soon as the box is in place. Needless to say you do not wish these rascals, but prefer our native birds. There is no sure way of keeping them out except by hanging the box on wires so that it swings freely in the wind. The objection to this box is that it proves less inviting to our native birds, and so should be attempted only as a last resort. One meets with greatest success with boxes placed on exposed poles or in trees, with the opening no larger than is necessary for our native birds, one and a half inch for swallows and bluebirds, smaller for wrens and chickadees.

Find the bird house. Last spring a pair of bluebirds lived in this house close beside a school in Ontario County

" *The box.*— No money need be expended on this. Old, weather-beaten timber is more attractive to the birds than smooth, painted boards. The best boxes may be made from sections of a hollow limb, covered above and below by weathered boards, and with a hole drilled near the top of one side. Artificial limbs can be made from bark or by hollowing out solid branches with the bark still attached. Old boxes or new ones made for the purpose are next best. For the smaller birds, such as chickadees,

wrens, bluebirds, and tree swallows, the boxes should measure not more than 12 by 5 by 6 inches, and they may be considerably smaller to advantage. The ordinary crayon box of the schoolroom is very serviceable, but requires reinforcing with wire or nails so as to withstand the weather.

"The box shown in the illustration is a crayon box, with an additional roof of tin from an old can, used because of the leaky condition of the box. Cigar boxes and codfish boxes are generally less satisfactory than odorless ones, and all bright surfaces should be avoided. A box with the top or one side hinged is better for observation, but care should be used to keep it permanently fastened.



"Old teakettles, tin funnels, and cans of various sorts have been used by some persons with success, but the box is more sightly and usually more attractive to the birds. The opening should be made circular or square, preferably the former, and toward the top of one side. It should be no larger than the dimensions given above.

"If one is not bothered with sparrows, a perch should be provided beneath the opening; but inasmuch as sparrows do not take so readily to boxes without perches as do other birds, it can be removed if necessary. A perch should be placed in the near vicinity, however, on which the birds may alight before proceeding to the nest.

"A layer of sawdust may be placed in the bottom of the box but the use of other nesting material is to be avoided. For chickadees and swallows, however, cotton or feathers scattered near may prove attractive if there is no poultry to furnish a supply.

"*Placing the box.*— Inasmuch as the birds prefer weatherworn materials to bright surfaces, it is well to have the box in position by early spring, and thereafter left from year to year. In placing it, three things should be borne in mind: attractiveness to the birds, comfort, and protection. For the swallows that prefer the open, the box should be raised on a

slender pole several feet above the fence, clothes pole, or outhouse, to which it is attached. The pole should be strong enough to prevent it from swaying in the breeze, and yet sufficiently slender to protect it from marauding cats. Sometimes if squirrels are abundant, it is necessary to place a metal shield about the pole in order to prevent them from climbing to the nest for the eggs or for the young. The pole should be near a building, a dead tree, a telephone wire, or other natural perch. Wrens and bluebirds also may frequent this box, but they prefer to have a tree in the immediate vicinity. Boxes placed seven to twenty feet up in a tree generally prove more attractive to the latter birds as well as to the chickadees and nuthatches; but care should be used to guard the tree from cats by shields of metal or wire netting. As exposed a position as possible should be chosen for the site yet one that is more or less shaded from the sun during the heat of the day. It is better to have the box face toward the South.

"Frequently boxes placed on the house or the school building, below or beside an upper window, prove attractive to wrens, swallows, or bluebirds, and are then near enough for observation. These boxes, however, are frequently overrun with English sparrows and are generally unsuccessful for that reason.

"The best results with bird boxes are always obtained by studying the habits of the birds of the neighborhood that nest in holes, and by reproducing their nesting conditions as nearly as possible."

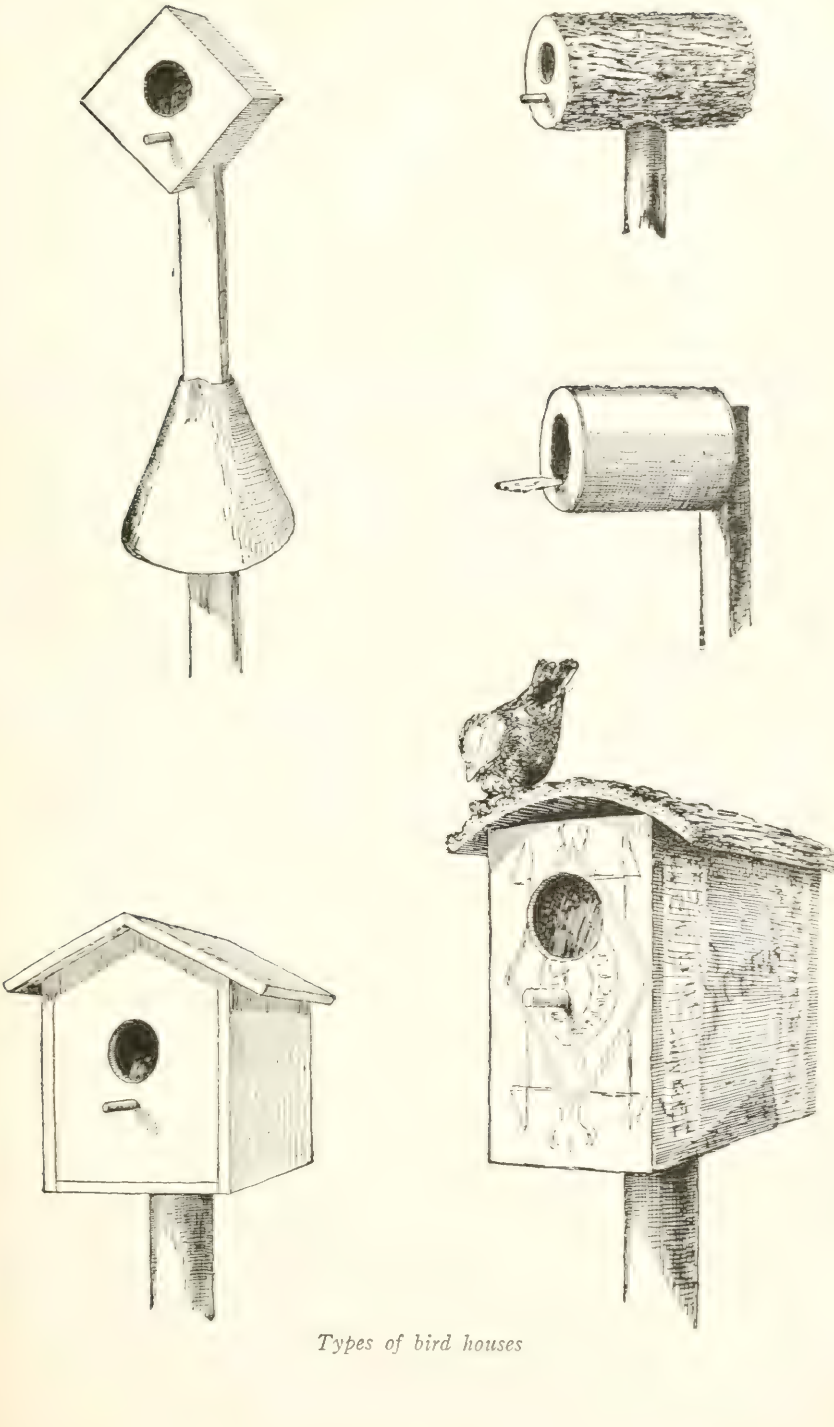
V. Make a bird calendar and have it ready to record the birds as they come back from the South. The migration table on page 11 of the teachers' leaflet will help you in this.

VI. Ask your teacher to let you have an examination on the winter weeds that you find above the snow. Who will know the greatest number?

VII. Of the trees for study this year, how many can you tell in winter and how can you tell them? Elm, locust, hemlock, beech, birch, cedar, chestnut, white pine, pitch pine is the list.

VIII. Remember the notebook on the horse that you are going to send us. We would like all these notebooks by May 1, in order that we may look them over and make the award before the schools close. You remember that we promised to send a book on the horse for the school library in the school from which we receive the best notebook. In the November leaflet next year we shall give a report of this competition.

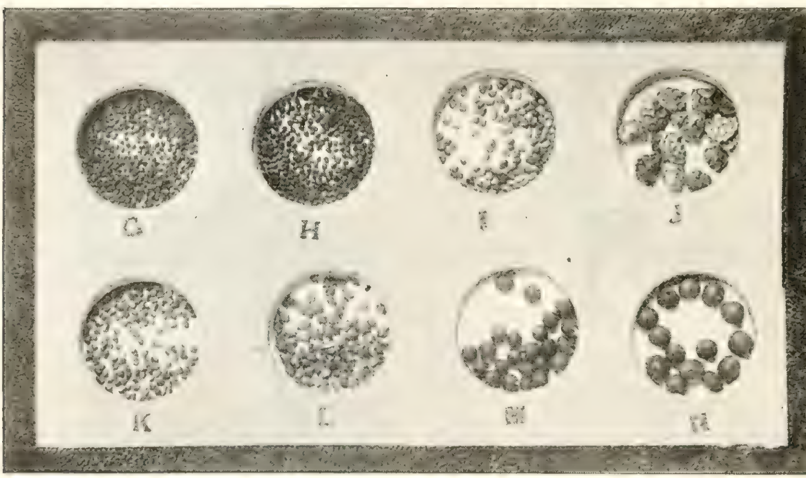
IX. Some Friday afternoon you may enjoy an hour looking over seed catalogues in preparation for garden plans. It is well for boys and girls in the country to know what is being sent out from seed houses, because good gardeners must always be up to date in matters of this kind. We know many scholarly people who enjoy happy winter evenings looking



Types of bird houses

over seed catalogues and making plans for gardens that will be planted at their homes when garden time comes.

X. Five more weeds. In the November leaflet we pictured the seeds of five weeds and suggested that each school begin to make a collection of weed seeds. We also described one good way to preserve seeds for study, and on this page there is a picture showing the kind of mount described. The mount in the picture, however, has a sheet of paper between the cardboard and the back cover of glass, and on the back of the paper the names of the seeds are written corresponding to the letters under the samples. The method of labeling the samples directly on the front as outlined in the November leaflet is, perhaps, a better one because then



Seed collection. See page 283 in the November leaflet

the name can be constantly associated with the seed. In this case the sheet of paper may be omitted, and should one desire to study the seeds without the names in order to test his memory, the mount may simply be turned over for the purpose. Five more weed seeds are shown in this leaflet and they have been chosen because it will be possible to find them even in the dead of winter. Many schools already have very complete collections of weed seeds, and we hope that they will spend some time in studying the different kinds so that each boy and girl will be able to identify a large number of the more common weed seeds at sight. This is a valuable work and will be useful in connection with the farm-seed-testing work that will soon be started. See page 1039. A word about each of the five weeds whose seeds are shown in this leaflet may be of interest, although every boy and girl is probably familiar with them.

1. Common, or broad-leaved, plantain is found in lawns and gardens. It grows close to the ground and has large broad leaves and long upright seed stalks. It lives year after year and must be cultivated out or dug out in order to be controlled.

Common plantain

2. Burdock is familiar to all boys and girls. It is found around buildings and sometimes in fields or orchards. It lives two years, producing seed the second season, and can be killed by cutting off the plants below the ground before seeds are produced.

Burdock

3. Ragweed is the most serious weed in newly seeded meadows, and while it lives only one year, it is difficult to control because the seeds will keep alive a long time in the soil. They will remain dormant until the ground is plowed again and will then spring up. No plants should be allowed to go to seed.

Ragweed

4. Pigweed, or redroot, is very persistent in cultivated crops. It can be distinguished by its rosy pink root and small, shiny, black seeds. It can be controlled by cultivation of the soil where it is prevalent and by pulling.

5. Beggar-ticks, while not a common weed, is one easily remembered for its curiously shaped seeds, which sometimes cause trouble in the wool of sheep.

Redroot, pigweed

Plants are arranged in three groups according to their length of life. Some start from seed in the spring, grow during the summer, produce seed, and then die. Their life is completed within one year, and they are therefore known as *annual* plants. Of the five weeds mentioned on this page, ragweed, redroot, and beggar-ticks are annuals.

A second group of plants takes two years to produce seed, and plants of this group are called *biennial*. During the first year of growth a rosette-like cluster of leaves is formed close to the ground, and this lives over winter. The second year a seed stalk is produced from the center of the rosette, and then the whole plant dies. The burdock mentioned above belongs in the biennial group, as do also the familiar mullein and the wild carrot.

The third group of plants lives for more than two years and produces seed season after season. These plants are called *perennial*, or hardy. There are many examples of this group among the weeds, the common plantain being one of them.

Beggar-ticks

Five weed seeds, natural size and much enlarged

TO BOYS AND GIRLS WHO WISH TO RAISE POULTRY

W. G. KRUM

The farm is not only a home but a place of business. Many boys and girls are looking forward to the time when they will have a business of their own. You do not need to wait until school days are over for there are many pleasant ways for boys and girls to earn money and at the same time to learn good business methods. One of these ways is to keep poultry. Would you like to start a poultry plant now? Is there an unused building, an empty stable, a place in one corner of a building that could be partitioned off for a small pen, or possibly some lumber or large boxes that could be used in building a colony house? Perhaps your father or

A start in the poultry business

an older brother would help you to make a place suitable for a small flock of choice hens, and would help you to purchase them. From these you could hatch your chicks in the spring and possibly sell some eggs for hatching purposes at a good price.

Another good plan would be to buy or borrow a sitting hen or two in March or April and purchase some eggs for hatching from pure-bred stock near home at a reasonable price. The sitting hen should be dusted with plenty of lice powder. She should be kept in a comfortable place where other hens cannot disturb her. Plenty of water, corn, and wheat, should be kept near her at all times. When the chicks are hatched, place them with the mother hen in a large coop under the shade of a tree. Have a board floor for the coop and a strong screen door to shut out rats at night. Then with good care, what fun it is to watch them grow! Of course, you

will want to buy your own feed and keep a good record of the cost. Then at the end of the year, you will be able to know how much real profit you have made. A large number of boys and girls in central New York are this year starting small bank accounts on the profits of their poultry plants begun two years ago.

Editors' note.— Boys and girls should remember that a good way to help toward success in raising poultry is to study the fowl and to acquire skill in understanding and meeting the fowls' needs. It would be interesting every year to have some lessons in the school on the poultry in your neighborhood so that boys and girls might learn something about the different breeds, the methods of successful poultry-raisers, the knowledge that is necessary to make poultry-raising profitable, and the like. Perhaps from time to time a hen or a rooster might be brought to school for the study of the different breeds; and when it is there, much interest might be developed in a quest for knowledge of the particular breed. In the teachers' leaflet for last year will be found some lessons that will help boys and girls in their plans for poultry-raising.

SEED STUDY

Last spring we received a letter from a rural school in Seneca County containing a description of some seed-testing work that the school had been doing. We were greatly pleased because for a long time we have wanted to start this kind of work. To do it well, however, requires a knowledge of farm seeds and of weed seeds and before we publish the letter on seed-testing it seems best to make some suggestions for the study of seeds of various kinds.

In the November leaflet you remember we suggested making a weed-seed collection, and in each leaflet we shall picture five kinds of weed seeds. (See page 1037.) Every school should begin such a collection and gradually enlarge it, all the while studying the seeds.

It is also necessary to make a thorough study of the seeds that the farmer sows. While it is comparatively easy to learn to tell the different kinds of seeds in bulk, how many boys and girls can tell one wheat seed from one rye seed, or from one barley seed? It is even more difficult to learn to know the smaller seeds — seeds of the clovers and grasses. The study of seeds is fascinating work, however, and many boys and girls will become expert in their ability to identify seeds of all kinds.

Some day each boy and girl should bring a small quantity of a different farm seed to school. Begin at first with the larger seeds, such as oats, rye, wheat, barley, buckwheat, vetch, rape, and the like. Only after these are thoroughly familiar should work be attempted with smaller seeds. At

first make a study of each kind of seed by itself. Then ask the teacher to mix a small quantity of two kinds for you to separate and to identify; then three kinds, and so on until you can take a mixture of all the kinds of farm seeds and separate each kind, giving it the proper name. This makes a sort of game and will be interesting as well as instructive.

The same method should be used in studying various kinds of weed seeds, and this will be much harder as the weed seeds are smaller as a rule. For all seed-study work a magnifying glass is necessary, and while a reading glass, such as is found in many homes, is satisfactory for the larger seeds, a stronger lens is needed for the smaller seeds. Every school should have such a lens for it will be of value not only in the study of seeds, but in observing small insects, the parts of flowers, and other interesting things. We know that many schools have a little money to spend during the year, and feel sure that no one thing would be of greater usefulness and interest than a lens. We have asked a number of reliable firms to give us their lowest net price, postpaid, on tripod magnifiers for use in schools. The magnifiers supplied by these firms may vary a little in quality, but any one of them should be satisfactory for seed study. If there should be any delay or difficulty in obtaining the magnifiers, please let us know at once.

The firms and the prices are as follows:

Bausch and Lomb, Rochester, New York	$.50, postpaid
Central Scientific Company, Chicago, Illinois	.50, postpaid
Kny-Scheerer Company, 404–410 West 27th Street, New York City	.50, postpaid
Leitz Company, 20 East 18th Street, New York City.	.40, postpaid
Spencer Lens Company, Buffalo, New York	.45, postpaid

Remit by stamps or postal money order to the firm selected.

In the study of seeds you will be getting ready for some very valuable and interesting work. In the March leaflet we expect to suggest methods of testing farm seeds, and we hope that in the years to come this will be a regular part of the rural school work in this State and that the crops grown will improve because of the better seed sown. Meantime, honest work must be done in preparation. In every rural school, boys and girls will come to have a thorough knowledge of all kinds of seeds. Write to us that you have begun the seed study, tell us what you have done, what you have learned, and whether or not you have found new and interesting methods to use. The work must grow through reports such as these, and we are looking to some schools to point the way to others. Let your school be one of the leaders.

Tripod magnifier

A LETTER TO GIRLS AND BOYS

Dear Girls and Boys:

Often have I thought of the letter I would write to you in this January leaflet, yet I am having hard work to begin now that it is time. Such a lot of things are tumbling over and over in my mind, that words on paper cannot express them as I wish. Recently I have visited a number of schools and talked with some of you face to face. These visits made me wish that I could see you all, but I know that is impossible and I shall have to try to write what I would say.

Some of you are going to schools in small villages where there are several teachers; others, to schools right out in the open country where at this time of year the wind is howling outside the windows and perhaps it is snowing. I hope you are neither too warm nor too cold. We cannot work with our minds when our bodies are uncomfortable. Nowadays we know about a type of stove for country schools that makes all parts

of the room of the same temperature. It is far better than the stove that is sometimes found in schools, which overheats those near it and leaves the far corners of the room cold. Many rural schools have this new kind of stove that has a metal jacket around it. Fresh air comes in from out of doors through an opening in the bottom of the jacket. The air is heated as it rises between the jacket and the stove, and when it leaves the top of the jacket the heated air spreads to all parts of the room. Since fresh air is always coming in, the bad air needs to be taken out; an opening is made for this purpose in the chimney flue below the place where the stovepipe enters it. There is not space in this letter to tell you all about these stoves even if you could understand the explanation, but I want you to know of them so that you can talk the matter over with the teacher and your parents and perhaps next year your school will have such a stove, if there is not one in it at present. The district superintendent will have something to say about this, if you ask him the next time he visits the school.

There is great danger these winter days that the schoolroom will be overheated. The air often gets impure when so many are breathing it in a closed room. Perhaps you will say that the teacher should take care of these things; but if you will think a minute, I am sure you will see that you should know about them too so that you will be able to help intelligently. I was in a schoolroom not long ago where my head ached before I had been there ten minutes, and I wondered how the boys and girls and the teacher could stand it. Every recess time the schoolroom should be aired for a few minutes while you are playing out of doors, and, even though it is a little cool when you come in, it will soon be comfortable again. You know we do not take cold easily just by being cold; but when we get too warm and then cool off suddenly, or when the air is not fresh and pure, we are certain to catch cold. The best temperature is one that is just high enough to keep our feet and hands warm and that leaves our minds clear and active. A temperature 66° F. to 68° F. is about right. Every school should have a thermometer or two, and with a little practice it will be easy to keep the temperature right and the air pure.

You will wonder why I am telling you these things and what they have to do with nature study and agriculture. It is because they are so very important and must be right before we can study nature, reading, history, or anything else. First of all, we must take care of ourselves and build strong, clean, well bodies. Then our minds will be strong also, and will be able to do more easily the work that comes to us each day. I like to see boys and girls with rosy cheeks that show the good red blood in their veins, boys and girls who can stand steady on two feet and hold their bodies straight, who can look me in the eye and shake hands in a firm, true way that makes me feel their friendship. I expect these things in

my friends, and shall give them in return. It takes two to be friends, you know, and each must be the things the other looks upon as good and worth the while.

In many schools where I have been, we have sung together. There are some songs that I like to sing, and always there are some that you like to sing, so we can sing to each other and with each other. There are schools that do not have an organ or a piano and for that reason cannot sing much, but I hope that every school is looking forward to the day when the opportunity will come. A good organ is very much better than a cheap piano and costs less. An organ is most like the human voice of any musical instrument, and it is a pleasure to sing with one. Whether or not there is an organ in the school, there must be one somewhere in the neighborhood, and it seems to me that sometimes you might find it possible to gather round it for an hour and sing together. There is nothing like a good song to loosen us up and make us more natural and human. And when we sing, let us sing the good old songs and hymns that have lived for years and years and been loved by many persons. Your teacher, or your mother, or your schoolmate's mother, or some one will help if you really want to sing and show that you are glad of their help. One thing we all need to do is to learn by heart the words of a number of songs. Suppose I should come into your school to-morrow and ask you to sing three songs for me all the way through without books. Could you do it? Some could, but I am afraid many could not, for I have tried it. Decide to know at least three songs before June and as many more as you can. Once you start you will want to keep right on learning them.

I have a word to say especially to the boys. It is not at all a criticism, for I was a boy myself not long ago and know that often we do not think about such things unless we have our attention called to them. The thing I refer to is the matter of removing your hats whenever you enter a building and of raising your hats to older persons whom you greet in passing. I have noticed many boys keeping their hats on at school fairs and other public meetings where I have been, and one time a boy sat in the front row with his hat on when I was talking to a group of folk. On the other hand, I remember with a great deal of pleasure standing with a lady watching some outdoor sports when a twelve-year-old boy whom she knew passed by. He raised his hat and said good morning in such a polite and cheery way that I wished that I knew him too and had him for a friend. All these little things count, and we are judged by them. I could not let the matter pass without a word to you because I want the boys in this State to be good, clean, manly fellows, considerate of others, and with eyes open to see that neighbors and friends always have a fair show. It is not what we get, you know, that counts; it is what the other fellow gets through us.

Now, I have at last come to say a word about the out-of-door and home study for the next few months. In this leaflet there are many suggestions that you will want to follow. If any of you have never found the joy of studying the life in the open, begin now, for it cannot be possible that all who love the world of nature are in the wrong, and that there is nothing for you too. Take, for example, your weed seed collection. Did you start making it after reading about the work in the November leaflet? You should have at least the five kinds of seeds given there, and in this leaflet there are five more, illustrated on page 1037, that you can find even in the dead of winter and can add to the collection. Read the article about seed study. I feel sure that this is a chance for some very interesting and valuable work. Lay your plans well and do not rush ahead without knowing where you are going, because when we are preparing to do work for others, we owe it to them to be careful and responsible. You will be pleased and astonished at the report on collecting the egg clusters of tent caterpillars. Perhaps your school has never done much with this piece of work. Begin now and help to control this serious pest. Read very carefully the article on page 1031, and write to me that you have done some of the things suggested. Start your plans for next year's garden. The March leaflet will have something about gardens. Continue with the study of the trees and see whether you can do as well as the four boys I know who can tell fifty kinds of trees by their twigs in the wintertime. Make friends with the birds and have a bird calendar ready for the first robin, bluebird, and the others that follow. Work hard, play hard, remember the things I have said in this letter, and write often to

Your friend,

Edward M. Tuttle

LETTERS FROM GIRLS AND BOYS

District 9, Town of Johnsburg, Warren County
Wevertown, New York, March 26, 1914

Dear Mr. Tuttle:

The pictures you sent came to our teacher and she gave them to us, and I thank you very much for mine. I think they were very pretty. The cow looked very natural. The man must be kind to his animals, and what a cunning little girl!

In this letter I am going to tell you about our chickadees. At first we hung some meat in the windows and they would come and eat. But one day Miss Armstrong went to the door and one of the chickadees flew in, and we were surprised, for we did not think they would get any tamer than coming to the windows. After a while we opened a window a little at the bottom and top, and they would come in the bottom opening and get a mouthful and go out at the top. At noon we would pick up all the crumbs and put them in a dish and set it out on the window sill, and in the morning when we came to the schoolhouse the chickadees would seem to be so glad to get in where it was warm. When it was cold nights we would bring in what the birds did not eat and thaw it out so they could have a warm breakfast. They soon got so tame that they would come in and eat from our hands and they would fly all around the room and did not seem the least bit frightened. One thing we noticed was that two chickadees never eat together. If one should come while another was eating, no matter how hungry he was he would always wait; and if he offered to eat, the other one would make a noise which sounds like this, *chur up, chur up*. When they are singing they say *chick-a-dee-dee-dee* and *phoebe*, and when they are startled they go *tweet tweet*. When they first began to come into the schoolroom, they would forget to go back through the same window and then they would fly around the room so we would have to catch them and they would make a queer noise which sounded like this, *cluck, cluck*. The prettiest I think is when they sing *tweety-tweet-tweet-tweet* as they fly through the air. I did not know they sang so many different songs until this winter.

We have seen five different blue jays around the schoolhouse at one time, but they were very wild. They would not come up to the window the way the chickadees would, so we threw pieces of bread out a little ways, then we would keep still and pretty soon they would fly down and get a piece. They are very pretty. They are bright blue with some black on their necks. Their tail feathers are very pretty. They are darker blue with black stripes. The queerest thing about them is that they have to straighten up when they say *jay* and another different noise They act lots different than the chickadees do. The blue jays act as though they were nervous. Looking for your next leaflet,

Sincerely your friend,

MYRTLE MALONEY

Editors' note.— Myrtle's letter is full of interest. This school did some real bird-study work last winter. Not only were many new things learned,

but there were the pleasant experiences of gaining the confidence of the chickadees and of receiving their welcome visits. Every rural school can do many things to attract the birds during the winter season, and interesting observations can be made while the birds are eating the food supplied. Ask your teacher to read again to you Doctor Allen's article on *How to Attract Wild Birds*, which begins on page 12 of the September leaflet.

District 1, Town of Van Buren, Onondaga County
Baldwinsville, New York, April 8, 1914

Dear Mr. Tuttle:

Since we have received the prize ears of corn of Onondaga County, I thought I would write a letter to you.

The name of the school that I attend is called Pleasant Valley school. It is about three miles and a half west of Baldwinsville. My teacher's name is Mr. Silas F. Parry.

I like to read the little leaflets that come from Cornell, and from reading these we decided to celebrate Corn Day. In the leaflets there are many interesting things that I like to read. We held Corn Day on December 5, 1913. During the day we decorated the schoolhouse with corn and cornstalks. We also planned to have a box social so that we could buy a new recitation seat. We also asked Professor Maxwell of the Jordan High School to speak upon growing corn. We lighted the schoolhouse with lanterns. The farmers had a good talk with Mr. Maxwell on farm questions. The school collector sold the boxes. There were about sixty persons to it. I think they all had a good time.

At the Christmas exercises we had an organ loaned us for the rest of the year to help us in the singing. We asked the older people to help us in the singing. There were about seventy persons to it.

Later on we had a spelling school for the old and for the young people. The old people spelled the young people down.

On the twelfth of February, 1914, the older people gave an entertainment. The older people were in all the dialogues but one. The children spoke a few pieces. We lighted the schoolhouse with bracket lamps and lanterns. Before the exercises commenced we sold popcorn and candy. The money was counted up and there was four dollars and eighty cents. We are going to buy some more bracket lamps with the money.

These meetings have made the schoolroom pleasant for the children by buying a new seat and pictures and creating interest in the school.

We are going to have two weeks of vacation — this week and next. We have cleaned up the school yard some and are going to clean it up more when we go back. I am very interested in nature study and have read some books. We are going to have some gardens this year. There is to be a prize given for the best garden. On Arbor Day we are going to have another entertainment in the evening. I remain

Your friend,

ERWIN AUYER

Editors' note.— They are doing things in the school that Erwin attends. It is easy to see from his letter that the school and the community are interested in each other. The spelling bee between the old and the young and the entertainment given by the older folk are both interesting and valuable forms of social activity and make a pleasant change from the usual school entertainments. Corn Day was a really worth-while occasion and every one learned something from it. The school had an organ loaned to it for a year. This might easily happen in many districts until the school can own an organ of its own. The photograph of the school shows that the teacher takes an interest in the children, out of doors as well as in

Recess at District 1, Town of Van Buren, Onondaga County

the schoolroom. We hope that this spring something will be done in the way of shrubbery planting around the school building. This would add greatly to its attractiveness and supplement the fine shade trees on the grounds.

District 2, Town of Pendleton, Erie County
North Tonawanda, New York, February 19, 1914

Dear Mr. Tuttle:

How glad I was to receive your letter telling me that you had not received three letters! I am sure I wrote three but maybe one was lost. I love to write to you so it makes no difference, and I'm so glad I got a letter from you.

I want to thank you for the January leaflet. I liked it the best of any so far. The pictures and letters were so very interesting, and I'm going to try and set the table the way that was suggested in the leaflet.

A few days ago one of our boys brought part of a mud dauber's nest to us. We all looked at it and our teacher told us about it. He is going to bring a yellow jacket's nest and then we shall look at it. It seems so wonderful to think that those little wasps can build such nests.

In the school we have a calendar telling us the time the sun rises and sets and when the moon comes up. We are trying to learn more about the things in the sky.

Our teacher has told us to be looking for the birds when they come, and we are going to do that. One of the boys has seen a bluebird.

Our nature study notebooks are beginning to get full of descriptions and pictures. We all like them.

I am in the sixth grade in District 2, Town of Pendleton. My teacher's name is Miss Borman. When I have passed my regents', I want to go to high school.

Thanking you for writing me that letter which I'm going to keep, I am

Your little friend,

RUTH HARTMAN

Editors' note.—Ruth's letter shows us that she and her schoolmates are wide-awake to the opportunities everywhere about them. Especially we are glad to hear of their resolve to study what they can of the sky — the sun, moon, and stars. This is a fascinating subject. Some persons do not know that the stars are all arranged in groups with names and that it is possible for any one to learn a number of the larger and the brighter groups, or constellations, as they are called. There is a very good book that might be added to the school library some time: *The Children's Book of Stars* by Mitton, published by the Macmillan Company, New York City. It costs two dollars.

District 5, Town of Cobleskill, Schoharie County
Barnerville, New York, April 10, 1914

Dear Friend:

I have just received the last leaflet that you sent and have nearly read it through.

The boys of our school have been trying to do some good through the advice of our teacher. We have been helping an old woman who lives near our school. We shoveled snow to make paths for her, and yesterday we drew some wood for her which our teacher bought. One boy obtained a horse and a wagon and was teamster, while the rest of us loaded and piled it up.

I like to read very much and have read a good many books that are in our school library. The one I like best is *The Man Without a Country.* I am

Your friend,

EARL D. STEVENS

Editors' note.—We publish this letter from Earl Stevens because we believe in the kind of service he and his schoolmates are giving. In

every community there are little acts of kindness that boys and girls can do if they will be on the watch for the opportunity and be willing to make the sacrifice. There is only one thing to remember, and that is, to do the kind act because you really want to and not just for the sake of showing off. The less said about it the better. We have known persons who all their lives have been giving to others without any one's knowing it except those who received their gifts. The knowledge that we have done a kindness out of the fullness of our heart is reward enough, and it makes no difference whether or not what we do is known to others. In fact, those who give most unselfishly do it quietly and without thought of praise. We are glad that Earl wrote to us because his letter will be suggestive to others.

PHOTOGRAPH BY VERNE MORTON

The start

TO THE OLDER BOYS AND GIRLS

There will come a day when you will leave the rural school, either to go to high school or to go to work. We have been such good friends through the leaflet that it is too bad for us to cease to keep in touch with each other. If you are interested, suppose you send us your name and address for a special list that we will keep, and in return we will write to you occasionally, and send you whatever publications from the College we think would be of interest and of help to you.

As you grow older you will be in a position to do much for your own and other rural schools. We know of a rural school where every time there is an entertainment or some special occasion for a community gathering, a large number of boys and girls fourteen to twenty-one years old come back and help to make it a success. These are those who have gone ahead but who still keep fresh the memory of their first school and have a desire to see that it prospers. We know that in the years to come there will be more and more of this, and that you will be loyal to the school that has given its best service to you. In order that you may help intelligently you will need to know some of the things that the rural schools are doing and planning, and it will be a pleasure to us to keep in touch with you as closely as we may, and through you to strengthen the schools of the State.

Therefore be sure to write to us when you leave the rural school, asking to have your name placed on the Advanced List. Address the Editors of the Cornell Rural School Leaflet, New York State College of Agriculture, Ithaca, New York.

A REPORT

A year ago last November it was suggested in the leaflet that boys and girls in the rural schools could be of great service in helping to control the ravages of a serious insect pest, the apple-tree tent caterpillar. This was to be done by collecting and destroying the egg rings that could be found in large numbers on the twigs of apple and wild cherry trees.

The suggestion met with instant response, and many hundreds of sharp eyes and willing hands went to work. It was found that the egg rings could be stripped off easily without injuring the twigs, and that with a little effort a fair-sized tree could be completely freed of the eggs so that in the spring there would be no unsightly nests and ravenous caterpillars. Such good work was done that we have tried to obtain a report from all the schools that collected egg rings. Up to the time this leaflet went to press, 1,655 schools had reported work done, and the total number of egg rings destroyed by actual count was 3,617,291. When

we consider that each egg ring will average at least 150 eggs, we see that the number of eggs destroyed reaches the enormous figure of 542,593,650.

This is good work. There has often been an element of competition introduced in order to see who could collect the most in a school, or which school could do best in a supervisory district or county. Small prizes have sometimes been offered by teachers, superintendents, and others, but even without such encouragement the boys and girls have been interested to work hard because they could see the useful results of their efforts.

In the northern part of the State another tent caterpillar, which works on forest rather than on fruit trees, has been abundant. It has similar habits to those of the apple-tree tent caterpillar, but the egg rings have flat instead of rounded ends. Reports have come to us of the very large number of egg rings and nests of the forest tent caterpillar destroyed by the boys and girls particularly in Clinton and Franklin Counties. The figures given above do not include complete reports from the rural schools in these counties. Special credit is due the teachers and boys and girls for their efforts.

There are some sections of the State that are comparatively free from tent caterpillars. This is true whenever thorough spraying is practiced and fence rows and roadsides are not allowed to grow up to wild cherry trees. In these days all farms with a number of fruit trees on them should have some kind of spraying outfit, and the trees should be sprayed annually both for insects and diseases. Likewise well-kept farms have clean fence rows and roadsides, thus preventing the breeding of weeds, insects, and diseases, and their subsequent spread to cultivated crops. These are conditions toward which we are working gradually, but meantime the tent caterpillars are not all gone. This winter again there are large numbers of the egg rings to be found in many parts of the State, and there is opportunity to continue the good work until the very time the eggs hatch in the spring.

We can now go a step farther and learn of an interesting thing in connection with the apple-tree tent caterpillar. In spite of all the efforts of man to check this and other insect pests, he would make slow headway were it not for the natural enemies that they have. There is an enemy of the tent caterpillar, a small insect belonging to the same family as do the bees and the wasps. Because it lives on another living insect, we call it a parasite. The wasp-like insect lays its eggs in the tent caterpillar's body, and when the caterpillar spins its cocoon, the egg of the parasite hatches, and the young larva kills the tent caterpillar so that it never transforms into a moth. Instead the parasite transforms, and the wasp-like insect comes out and attacks more caterpillars.

The tent caterpillars begin to spin cocoons during the latter part of June. One school reported that last year 8,000 of these cocoons were destroyed. Now, it is quite probable that in doing this a large number of the beneficial parasites were killed. Professor Herrick, who prepares the insect work for the teachers' leaflet, has suggested that after the cocoons are collected they be kept in jars with cheesecloth or netting covers until the wasp-like parasites emerge. Then the parasites can be set free to continue their good work, and the old cocoons and any tent caterpillar moths remaining can be destroyed. This will be interesting work for the summer, and we hope that the boys and girls will keep it in mind and have the added interest in not only fighting an insect pest directly, but in fighting it with another insect that is its natural enemy.

Notice.—We are advised by the Government Printing Bureau of Canada that the book entitled "Farm Weeds," which we recommended in the November leaflet, is out of print. We would suggest in its stead "A Manual of Weeds," by Ada E. Georgia, published by the Macmillan Company, New York City, and costing $2 net, postage extra.

Cornell Rural School Leaflet

FOR BOYS AND GIRLS

Published by the New York State College of Agriculture at Cornell University, B. T. Galloway, Dean; George A. Works, Head of the Department of Rural Education. Entered as second-class matter at the post office at Ithaca, New York

ALICE G. McCLOSKEY and EDWARD M. TUTTLE, Supervisors and Editors

ARTHUR D. DEAN, C. H. TUCK, W. E. PIERCE, and G. F. WARREN, Advisers

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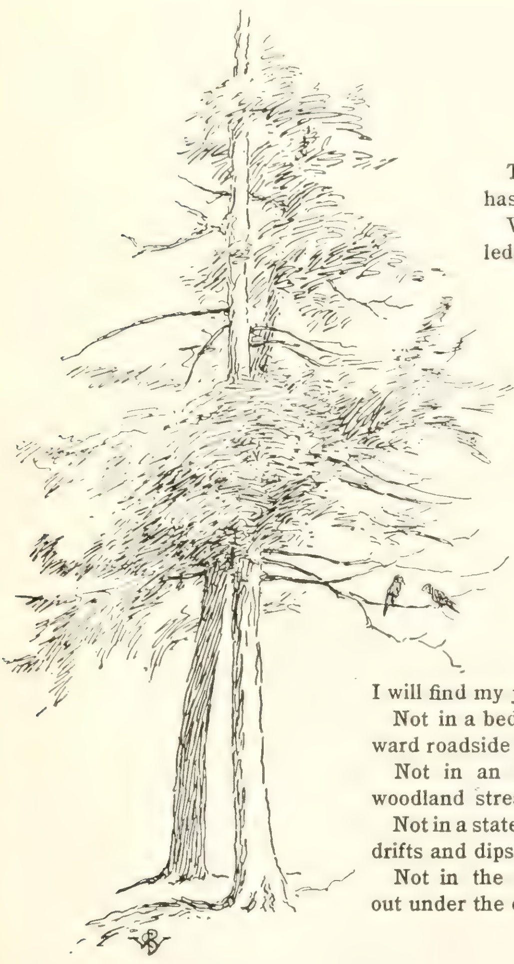


There are no surprises to him who has ordered his life.

Who planted the tree at his window ledge is not surprised that birds should come singing there.

Who nurtured the shrub by his garden wall is not surprised when the roses bloom.

Who set his tent by a heaven-blue lake is not surprised at morn that great white swans are resting near.

From *My Little Book of Prayer**

MURIEL STRODE

I will find my joy —

Not in a bed of hothouse roses, but in a wayward roadside flower.

Not in an August seashore, but in a hidden woodland stream.

Not in a stately ocean liner, but in a tiny boat that drifts and dips and trails among the water lilies.

Not in the emblazoned halls of revelry, but out under the quiet stars.

From *My Little Book of Prayer**

MURIEL STRODE

* By courtesy of Open Court Publishing Company, Chicago, Illinois.

BIRD NOTES

Every year boys and girls in New York State are learning to know the birds better. We are receiving hundreds of letters from rural schools in which teachers have this year helped the children to establish feeding stations for the birds, and have encouraged the building of bird houses. We are constantly receiving excellent descriptions of birds that the children have seen, but the names of which they do not know. The descriptions are improving, and the expert is nearly always able to give the right names of the birds described. These are sent to the schools.

All young persons who are now making effort in country districts to have the New York State farms the best in the world are taking an interest in birds, because knowledge of bird life is important to good farming. Added to this is the fact that song birds give joy in country places, and that through the years farm folk are going to take greater interest in them as they come to know them better. There are a few birds that are troublesome, and whenever they cause disturbance in your locality, your parents will be able to get information regarding the means of controlling them by writing to the State College of Agriculture. It is a mistake for boys and girls to think that they are doing good by killing birds; on the contrary great harm is likely to come as the result of the destruction of bird life. Boys and girls should study the habits of birds that are considered a nuisance, for information gained from such observation is valuable.

Nearly all the school children of the State are familiar with the birds given for study this year with the exception, perhaps, of the great blue heron. If any of you live near a lake shore, you may have an opportunity to see one of these stately birds standing, as Dr. Allen expresses it, "humped up like a piece of driftwood." If you chance to see one, notice how he waits for his prey, and how he catches it. Try to find out whether he has any bird note, pleasant or otherwise. Try to find out what he eats. Have you seen him hunting alone or with other herons?

When you are on the lookout for the great blue heron, perhaps you will see the little green heron, which is about the size of a crow, and is described in the teachers' leaflet.

To learn to know all the birds about your country home by sight and by their songs will be an achievement. If you learn to whistle the notes of the birds that whistle, there will be an added interest in your study. If in your garden a family of birds is living in a house that you have made, you will watch them with much pleasure. Daily thought for these farm helpers should be given; the cats should be controlled particularly during the birds' nesting season, so that they are not free to wander about the place at night. Water should be left where the birds can use it freely.

BALTIMORE ORIOLE

QUOTATIONS

SONG SPARROW

A lofty place he does not love,
But sits by choice, and well at ease,
In hedges, and in little trees
That stretch their slender arms above
The meadow brook; and there he sings
Till all the field with pleasure rings;
And so he tells in every ear,
That lowly homes to heaven are near
In " *sweet-sweet-sweet-very merry cheer.*"

From *The Song Sparrow*
by HENRY VAN DYKE

CHIPPING SPARROW

I hear the sparrow's ditty
Anear my study door;
A simple song of gladness
That winter days are o'er;
My heart is singing with him
I love him more and more.

From *A March Glee*
by JOHN BURROUGHS

WHITE-THROATED SPARROW

I take my way where sentry cedars stand
Along the bushy lane,
And whitethroats stir and call on every hand,
Or lift their wavering strain.

From *In October*
by JOHN BURROUGHS

WILD GEESE

Hark, what a clamor goes winging through the sky!
Look, children! listen to the sound so wild and high!
Like a peal of broken bells,— kling, klang, kling,—
Far and high the wild geese cry, " *Spring! It is spring!*"

From *Wild Geese*
by CELIA THAXTER

BLUEBIRD

The world rolls round — mistrust it not
Befalls again what once befell;
All things return, both sphere and mote,
And I shall hear my bluebird's note,
And dream the dream of Auburn dell.

From *May Day*
by RALPH WALDO EMERSON

VEGETABLE GARDENING

PAUL WORK

A garden is a source of good fun because every day there is something new to be seen and learned in it. Every year the crop can be made a little better, new combinations can be planted, and new results can be achieved.

Besides being good fun a garden is worth while for its products. Fresh vegetables for the home table go far toward making living better, and good vegetables may be sold so that they will yield a ready return of cash. The young gardener is, moreover, learning things that will be useful to him throughout life and that will enable him to enjoy life better. Best of all, he is learning to love plants and the out-of-doors.

In considering garden work for 1915, you must first decide whether you are to have a home garden to supply vegetables for your family, or whether you are to have a market garden. The former will be of help to your mother and will give pleasure to the whole family; the latter will give you business experience and ready cash. If your garden is to be a money-making proposition, you must keep account of the cost as well as of the income, and you must handle the garden so well that it will pay for itself and yield a profit besides.

Whether you start a home garden or a market garden, do not undertake it on too large a scale. A small garden well tilled is much better than a large one neglected. Do not try to plant all of the kinds of vegetables. For a market garden do not plant more than three kinds. For the home garden ten or twelve kinds of vegetables should be enough for the first year. If you are successful with these, you may include more the next year. It is better to regulate the size of your garden according to the amount of weeding and hoeing you are willing to do in the hot sun of next July rather than according to your enthusiasm for looking at catalogues by the fireside in January.

Begin work on your garden early. The plan should be made and carefully studied, so that time may be saved during the planting season. Seed should be bought well in advance and should be tested. Too much care cannot be used in the spading and raking of the soil. If the garden plot is large enough to work with horse labor, your results will be achieved with less cost, and the profits will be greater.

Above all, give the garden good care from the day the spade is first driven into the soil until the last bit of refuse is cleared away in the fall. Hoeing, weeding, thinning, and training are absolutely necessary. Every neglect is followed by loss in the crop, and poor crops mean discouragement and failure. They spoil the fun. It is better to have no garden than a poor one.

If you do not know how to make a garden, the general directions in this leaflet will help you, and more complete information may be found in Cornell Reading-Course Lessons Nos. 33, 34, and 58. Your teacher may obtain a copy of each of these lessons for the school library by writing to the College for them. One of the best ways to learn gardening is by talking with good gardeners in your own neighborhood and by visiting their gardens. They know the limitations and possibilities of your soil and your climate, and can help you better than almost any one else.

Keep a record of your garden work. Save a copy of your plan. Record each day the work that you do and the plantings that you make. This will help you greatly next year. You will thus learn how to repeat your successes and how to avoid mistakes.

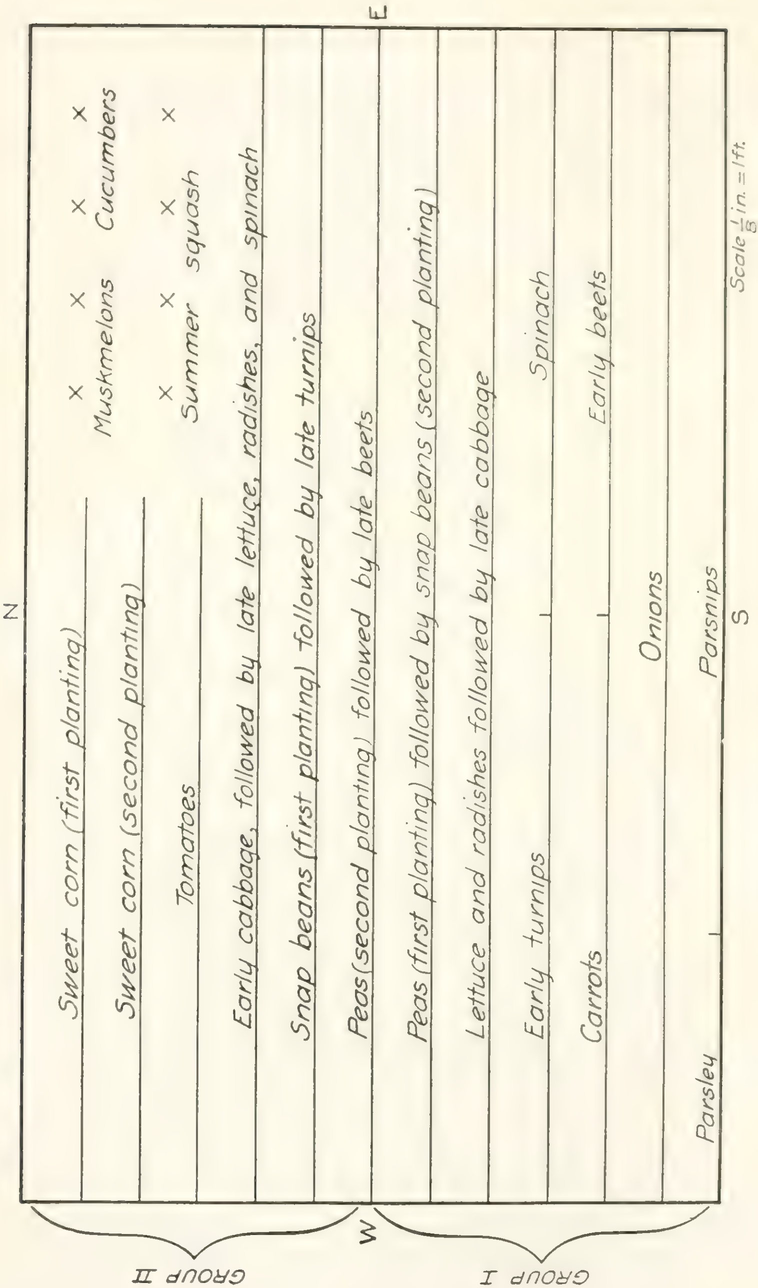
THE HOME VEGETABLE GARDEN

Note.—This article is for the older boys and girls who want to have a garden that will provide food for the home table.

In the March leaflet last year we gave a plan for a home vegetable garden thirty by fifty feet. Reports have come to us in letters from boys and girls who tried to follow the plan, and in order to test it ourselves we made such a garden last summer. The result of all this experience showed that there are some changes that can be made to advantage. The new plan is given in this article, and we hope that this second season more boys and girls will plant a garden of this size. Of course, the plan given is merely suggestive, and it will not be the same as yours, but perhaps it will help you.

After deciding on the kinds of vegetables to be grown, the first thing to do is to make a plan of the garden. Take a clean sheet of paper and determine on a scale of measure. For example, let every inch on the paper stand for eight feet in the garden; then each foot will be represented on the plan by one-eighth inch of space. In order to avoid confusion, make all rows two and one-half feet apart. The vine vegetables, cucumbers, summer squash, and muskmelons, need more space between hills; and they can be placed by themselves in one corner of the garden. With this in mind, begin at the south edge of the plan, with the scale measure off toward the north five-sixteenths of an inch, the equivalent of two and one-half feet in the garden, and draw a line representing the first row. Continue this process until the entire garden has been divided in rows. There is space for eleven rows.

In looking over the list of seeds, we find that some should be sown early in spring, that others must not be sown until after all danger of frost is past, and that still others must be started in the house and the



Plan for a home vegetable garden thirty by fifty feet

growing plants set in the garden later. Beets, carrots, lettuce, onions, parsnips, peas, radishes, and early turnips should be planted early. Since none of these are tall growing, they can all be planted on the southern half of the garden. We remember that one of these vegetables, parsnips, is treated differently from the others in that it is left in the ground and dug during the winter. Since we are going to clean up our garden plot in the fall and should not like to have a row left somewhere in the middle, we place the parsnips on the very southern edge of the garden, making an additional row.

We decide on a row of onions, a half row each of carrots, early beets, early turnips, and spinach, a row of lettuce and radishes, and a row of peas, and indicate them on the plan. This completes the first group of vegetables, and leaves all the ground to the north unoccupied and in good shape to be raked over occasionally so as to kill weeds and preserve moisture before sowing the second group of seeds, which must not be planted until all danger of frost is over. This group includes vine vegetables, sweet corn, and beans. The young plants from tomato, cabbage, and parsley seed, sown in the house, will be ready to set out at the same time. We need only a few plants of parsley, and, since they grow the entire season, they might well be placed in a few feet of the parsnip row at the south side of the garden. We must provide for two plantings of sweet corn, and we should have a second sowing of peas. All these things should be kept in mind as we begin next the northern row of Group I to indicate on our plan a row of peas for a second planting, a row of snap beans, a row of early cabbage, a thirty-foot row of tomato plants, and two thirty-foot rows of corn. These — except the second planting of corn, which, of course, should be a week or two later than the first planting of corn in the outside row — the cucumbers, the summer squash, and the muskmelons can all be sown about the same time, after all danger of frost is over.

This completes the garden for early summer. It is quite possible, however, that several of the vegetables will be through bearing about the first of July, and we can fill their places with late vegetables for winter. Begin at the southern side of the garden, look over the plan, and decide which vegetables may be replaced and with what we shall replace them. In actual practice our plan may not work out in all cases because of a backward season or for some other reason, but it is well to be prepared, and no ground should lie idle if we can help it. The parsley, the parsnips, the onions, and the carrots will surely remain all season; and probably the early beets, the early turnips, and the spinach will not be out in time for anything else to be sown. Lettuce and radishes may be followed by late cabbage, which can be set even before all the lettuce has been used. The first

planting of peas will be out in time for a second planting of snap beans, and the second planting of peas may be followed by late beets. The first planting of snap beans will probably be completely used, and the vines can be pulled in time for a sowing of late turnips. The early cabbage will be out of the way in time for a sowing of late lettuce, radishes, and spinach, about the middle of August. The tomatoes, the corn, and the vine vegetables will, of course, remain.

If the garden is a success, we should have a good variety of vegetables to store for winter use: parsnips, onions, carrots, cabbage, dry snap beans, beets, and turnips.

The plan is now complete, and by measuring with our scale we can determine how many feet of row and how many hills of each vegetable there will be. By looking at the offers of the seedsmen on pages 1073 and 1074, we can determine how many packets of seed we shall need and what they will cost. It is always wise to buy a little more seed than will be needed. The seed order should be made out and sent at once.

The garden plan, which we have given in order that you may see how to prepare your own plan, will serve merely as a guide. Each boy and girl who is going to have a garden should sit down and work out his or her plan in the same way, whether the garden is to be large or small. The garden of thirty by fifty feet is a good size for an active boy or girl twelve years of age and upwards. If you are younger than twelve years, perhaps it would not be wise to undertake such a large garden. For a smaller plot of ground, fewer vegetables had better be grown. Even a boy or girl eight or nine years old can take care of a strip of ground ten by fifteen feet and grow a crop of radishes and lettuce, or cabbage, tomatoes, sweet corn, or any one or two of the vegetables that the family will enjoy.

Now let us suppose that your garden plan is complete and that you have sent for the seeds that will be needed. For plants that should be started indoors, you can prepare the boxes, or "flats," before the seeds come. Early cabbage and tomato plants and a few plants of parsley are all that it is necessary to start in this way, but, if you choose, you may also start cucumber, squash, or lettuce. Find or make shallow boxes, three or four inches deep and a foot or more square, and bore holes in the bottom for drainage. Next the bottom, place a layer of coarse spongy material, such as moss, sawdust, or coarse manure. On top of this, place very fine rich soil, and take pains to have this soil right. You can make a screen out of some wire netting to use in sifting the soil. As the soil is put into the box, pack it down firmly. When the box is full to within a half inch of the top, it is ready for the seed. Use one box for each kind of seed. Do not sow the seed until about six weeks before it is time to set plants outdoors. At one side of the box make a straight furrow in the soil and sow

a row of seed. Sow two or three rows if you think that they will be needed. Cover the seed with finely sifted soil from a quarter to a half inch deep, and firm gently. Leave the rest of the space in the box unoccupied so that the plants may be transplanted into it after they are well started. This transplanting process is called "pricking out" and simply means that you take the tiny plants (about an inch high) and set them in new places, an inch or two apart. Be very careful to do this without injury to the plants, and be sure to press the soil firmly around them. They will have room enough to grow until you are ready to set them out of doors in the garden. A south window in the kitchen is a good place to set the flats, which should be kept moist.

Hoeing potatoes

While the plants are starting indoors, you will be watching the outdoor garden plot each day; and finally it will be dry enough so that it can be worked. Begin at once. If the ground was plowed last fall, it has been broken and crumbled by the freezing and thawing of winter and can be put in shape quickly. If spring plowing must be done, cover the ground with a good coating of barnyard manure. The labor of plowing or spading the ground is always the heaviest part of the work and often is discouraging. If you show your father or big brother that you are in earnest about the garden and mean to make it worth while, you will surely have help with this part of the work. After the soil is turned over, begin to level it and to make it fine with a rake or a harrow. One of the secrets of a good garden is to have the soil in the best possible condition before the seeds are sown. Moreover, it is very much easier to work when there are no young plants to avoid. Perhaps there will be several weeks between the time you plow and the time when it will be safe to sow some of the seeds. Certainly this will be true of the seeds included in Group II. Meanwhile there is opportunity to kill two or three crops of weeds by letting

them sprout and then raking the garden. Every weed killed before planting the garden means less trouble afterward. Work faithfully in order to obtain a good seed bed - one that is fine, firm, moist, warm, and free from weeds.

It is impossible to give exact dates for planting the seeds. The time will vary with the kind of seed, with the season, and also with the location. There is considerable difference in temperature between southern and northern New York, for example, Long Island and St. Lawrence County. You will have to develop judgment about time of planting. Those seeds that may be hurt by frost should not be planted until all danger is past.

Sow the seeds according to the plan you have made, measure distances carefully, and make the rows straight and even. It is always well to use a garden line as a guide. Be careful not to sow the seed so thickly that you fail to cover the space allotted. Tiny seeds slip between the fingers easily and are gone before you realize it. Guard against this. Sow the seed as evenly as possible, and cover it to the required depth, firming the soil well. The best garden is not all sown in one day and then left for a couple of weeks until plants and weeds have sprouted. Each vegetable is studied and sown at the best time for its development. Often, however, it is not practicable to do this, and then certain seeds can be grouped as indicated on our plan. Boys and girls who have opportunity to visit their gardens daily will find much success and pleasure in treating each vegetable by itself and studying its peculiar needs.

Care of the garden should be constant and thorough. Not a day should go by that does not find you in the garden for a time doing those things that need to be done. " A stitch in time saves nine," and often a few hours or a day will make all the difference between success and failure.

One of the most important matters is that of thinning. It hardly seems right at the time to thin a row of fine little beet or turnip plants by pulling out most of them, leaving only the strongest plants six inches apart. Later on, however, you will realize that the plants that were left have grown better and more rapidly because they have had room, and they will be tender in quality and fine in flavor because they were not stunted.

There are often vacant places in the garden that can be used by setting in a lettuce or a cabbage plant. Do not leave such places unfilled. Transplanting is not a difficult process although many persons are not successful because they are not careful. Good gardeners are able to transplant almost any plant. It should be done late in the afternoon, and, if possible, while the soil is moist after a rain. The plants should be well soaked before they are dug up, so that plenty of soil will cling to their roots. Dig a hole in the proper place, larger and slightly deeper than the roots of the plant, and set the plant in the hole. Cover the roots with soil

and press it firmly around them; fill in more soil, pressing it down now and then, until the level of the ground is reached. The secret of the operation is to transfer the plant to a new place without exposing the roots to the air for any length of time, and to see that they are closely covered when reset.

Cultivation, or the stirring, of the soil has two functions: it kills weeds, and it helps to hold moisture in the soil. Weeds should never be allowed to get a start. Natural moisture is better than water put on with a hose or from a watering pot. Any loose material lying on the surface of the soil will prevent the moisture from evaporating in the heat of the summer sun. You can make the top layer of soil act as the protective covering by keeping it loose and crumbly. After each rain, as soon as the soil can be stirred, take a rake and break up the surface soil. This will soon dry out, and, to one who does not know, will seem too dry. But if this layer of an inch or so of dry soil is brushed off, firm, moist soil will be found underneath, and it will remain moist even during a long drought. Whether there are weeds or not, you should cultivate whenever the surface becomes packed, in order that at all times the surface soil, or "soil mulch," as it is called, may protect the under soil and save moisture.

If watering becomes necessary, do it thoroughly. Do not merely sprinkle the surface of the soil, for the moisture will evaporate in a very short time and leave it baked. Soak the ground well, and, as soon as the surface begins to dry, stir it into a mulch as you would after a rain.

There will be injurious insects and diseases in the garden; but the better kept the garden is, and the healthier the plants are, the less the danger will be. If the trouble is serious, find out what causes it, and ask some one who can help you what to do to control it. See page 1066.

In the fall the garden plot should be cleared and left in good condition for the winter. All vegetables that are usable should be carefully harvested and stored where they will keep. The vines and the plants should be pulled and piled, the sweet corn should be cut and shocked, and the garden should be cultivated and raked until it is free from weeds and is in good order. If the soil is heavy, plow or spade it in the fall.

All that is written here, and much more that might be written, is of little value compared to your own personal study and care of the garden. There are a few general rules for gardening, but there are, in addition, hundreds of detailed practices that will come to one who watches intelligently and who loves to make things grow vigorously and well. The rules we have tried to give; the details you must find out for yourselves. If you have a garden that is worth while this summer, if you plan it thoughtfully, and if you care for it faithfully, you will find one of the real pleasures of life. In years to come, no spring will approach without finding you

making plans, no summer will pass without your presence in a garden, and each garden will be better than the last. To sum up, a successful vegetable garden depends on the following considerations:

1. A well-thought-out plan
2. Good seed
3. Thorough preparation of the soil
4. Careful sowing and transplanting
5. Proper thinning
6. The soil mulch
7. Control of pests — weeds, insects, diseases
8. Watchfulness, study, care

SOME GARDEN RULES

C. E. Hunn

TIME OF SOWING

The following statement will be found helpful as a general guide for sowing seeds:

1. Flower seeds that may be sown as soon as the ground is fit to be worked in the spring: alyssum, bachelor's-button, calliopsis, candytuft, four-o'clock, marigold, mignonette, morning-glory, nasturtium, pansy, phlox, pink, poppy, scabiosa, sweet pea, verbena, zinnia.

2. Flower seeds that should be sown after danger of frost is over. The best results are obtained if the plants are started in the house in April and are set out after the tenth of May: aster, balsam, cockscomb, larkspur, petunia, sunflower.

3. Vegetable seeds that should be started indoors: early cabbage, parsley, tomato.

4. Vegetable seeds that may be sown as soon as the ground is fit to work in the spring: beet, carrot, lettuce, onion, parsnip, pea, radish, spinach, turnip.

5. Vegetable seeds that should not be sown until the ground is warm and all danger of frost is over: bean, corn, cucumber, muskmelon, squash, watermelon.

DEPTH OF SOWING

The following statement will be found helpful in planting seeds:

1. Flower seeds that should be planted not over one-half inch deep: alyssum, balsam, candytuft, cockscomb, four-o'clock, larkspur, mignonette, morning-glory, pansy, petunia, poppy, scabiosa.

2. Flower seeds that should be planted one inch deep: aster, bachelor's-button, calliopsis, marigold, phlox, pink, verbena, zinnia.

3. Flower seeds that should be planted two inches deep: nasturtium, sunflower, sweet pea.

4. Vegetable seeds that should be planted one-half inch deep: cabbage, carrot, cucumber, lettuce, muskmelon, onion, parsley, radish, tomato, turnip.

5. Vegetable seeds that should be planted one inch deep: beet, parsnip, pumpkin, spinach, squash, watermelon.

6. Vegetable seeds that should be planted two inches deep: bean, corn, pea.

THINNING AND TRANSPLANTING

In order to have a good garden, each plant should have room for its fullest development, and since most of the seeds of garden flowers and vegetables are small, it is almost impossible to sow the seeds sparsely enough so that each plant will grow to perfection. Since this is the case, the plants must be thinned, and the excess either thrown away or transplanted to some other part of the garden. If the thinning is done in cool, cloudy weather, the seedlings may be transplanted with great ease; but if it is done in dry, sunshiny weather, the seedlings must be shaded after being set out. It is best to thin the plants when they are small, before they have become crowded; but if one wishes to save them for transplanting, they may be left until they are large enough to handle. The following statement will be found helpful to young gardeners in thinning and transplanting:

1. Flowers that should be four inches apart: alyssum, balsam, candytuft, poppy.

2. Flowers that should be six to eight inches apart: bachelor's-button, dianthus, four-o'clock, mignonette, morning-glory, pansy, phlox, sweet pea.

3. Flowers that should be twelve inches apart: aster, calliopsis, cockscomb, larkspur, marigold, nasturtium, petunia, scabiosa, verbena, zinnia.

4. Flowers that should be eighteen to twenty-four inches apart: sunflower.

5. Vegetables that should be six inches apart: beet, lettuce, parsnip, parsley, spinach, turnip.

6. Vegetables that should be twelve inches apart: snap bean, cabbage.

7. Vegetables that may be sown thickly: carrot, onion, pea, radish.

8. Vegetables that should be two to three feet apart each way: corn, Lima bean, tomato.

9. Vegetables that should be three to five feet apart each way: cucumber, muskmelon, pumpkin, squash, watermelon.

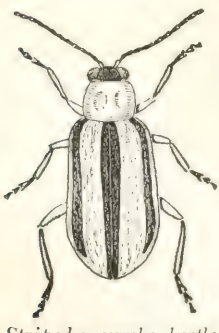
FOUR COMMON GARDEN PESTS

GLENN W. HERRICK

THE STRIPED CUCUMBER BEETLE

Appearance of the beetle.— The striped cucumber beetle is only about two-fifths of an inch long. Its ground color is yellow above, with a black head, and with three black lines running lengthwise of the back. The underside of the body is mostly black. The larva is a slender, white, wormlike grub, which lives below the ground on the stem and roots of cucumbers.

Story of its life.— The beetles spend the winter hidden away beneath leaves and other rubbish, but they appear early in spring and feed on such flowers as they can find until the cucumbers and melons are up. They lay their eggs in crevices of the soil near the roots of the melon plants, where they hatch, and where the white, slender larvæ live for about one month. When full-grown the larvæ change to whitish pupæ, and in about a week the adult beetles appear. The life cycle occupies probably about six weeks, and there are two generations a year in most parts of New York State but perhaps three on Long Island.



Striped cucumber beetle, enlarged

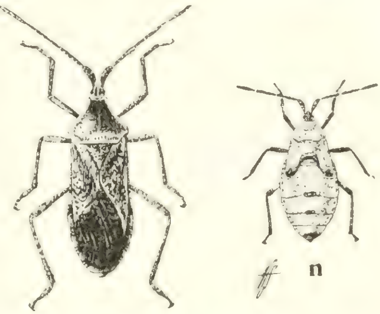
Injury and control.— In spring the hungry beetles eat the leaves and flowers of the young plants of cucumbers, melons, and squashes, and cause severe injury, sometimes destroying the plants. The slender larvæ also do some injury by gnawing into stems underground, and into the roots.

Plants may be protected from these beetles by putting boxes around them, by keeping the leaves covered with finely sifted ashes or air-slaked lime, by planting an excess of seeds, by spraying the plants with arsenate of lead (two and one-half pounds to fifty gallons of water), or by sprinkling powdered arsenate of lead on them. Whatever is done must be done thoroughly and often.

THE COMMON SQUASH BUG

Appearance of the squash bug.— The adult squash bug is usually more than half an inch long; very large ones may be nearly three-fourths of an inch in length. It is blackish brown above and specked with yellow underneath. Its head is small and narrow and bears a prominent black eye on each side. Reaching out in front are two long antennæ, the joints of which are long enough to be counted with the naked eye. On the under-

side of the head is a long, slender beak, which is carried close to the body between the first two pairs of legs. This beak constitutes the mouth parts of the bug, and makes it, therefore, a sucking insect.



The squash bug: a, adult; n, nymph

The beak has a deep groove on the upper side. Lying in this groove are four tiny, threadlike bodies. These have fine, sawlike teeth at their free ends, and are used by the insect to puncture a leaf or a stem. The juice of the plant is then drawn into the mouth of the insect.

Story of its life.— The full-grown bugs hide in the fall beneath stones, boards, leaves, and any rubbish that they may find. In spring they come from their hiding places and begin their search for squash vines. When they find the plants, they soon commence to lay their brown eggs on the underside of the leaves, and sometimes on the upper side also. Occasionally the eggs are laid in regular rows, as shown in the illustration. In from eight to twelve days small green and black bugs hatch from the eggs. They are somewhat like the full-grown bugs, but without wings and with long legs. They are called nymphs, and each one has a beak with which it punctures the leaf and sucks out the juices. The nymphs grow and shed their skins five times before they become adults. More than a month is usually required for the bug to reach full size.

Injury and control.— The squash bug punctures the leaf, sucks out the juice, and injects into the leaf a poison that kills the cells and causes the leaf to turn brown and wilt. It also carries a disease from one vine to another that may cause the death of the plants.


Eggs of a squash bug on a leaf

Poisons will not kill the bugs, but early in the spring one should keep a sharp lookout for the adult bugs and catch them by hand before they lay their eggs. A little later the eggs may also be destroyed.

The bugs may be trapped under pieces of boards, bark, or shingles laid on the ground. The bugs will crawl under these for shelter, and there they may be caught and killed.

THE IMPORTED CABBAGE BUTTERFLY

Appearance of the insect. — The parent imported cabbage butterfly has two pairs of large, strong, white wings. Each of the front wings has a black patch in the outer corner; the wings of the mother butterfly bear two black spots in addition, while those of the father insect bear but one black spot, or patch. The wings are sulfur- or straw-colored on the underside. The body of the butterfly is long and slender, and dark in color. The long, slender feelers, or antennæ, project from the head. Each antenna ends in a swollen knob. The caterpillar is velvety green in color, and about one and one-fourth inches in length when full-grown. There are a faint yellow stripe down the middle of the back and a row of yellow spots along each side of the body.

The imported cabbage butterfly; male above, female below

Story of its life.— The butterflies appear early in the spring, and the mother insect soon begins to deposit her whitish or pale yellow eggs on the leaves of the cabbage, one in a place. These hatch in about one week, and the tiny green worms appear. The velvety green caterpillars become full-grown in about two weeks, and each one transforms to a pupa which, owing to its peculiar appearance and silvery markings, is called a chrysalis. The chrysalis may be fastened to a cabbage leaf or to a board or paling in an adjacent fence. The insect remains in the chrysalis stage for from one to two weeks, then the butterfly appears, thus completing the life cycle, which is passed in from twenty-two days to five weeks. There are at least three broods in a season in New York.

Parts of cabbage leaf, with eggs at A, caterpillars at B, and chrysalis at C

Injury and control.— The caterpillars riddle the outer leaves of the

plant and crawl down into the head, where they injure and soil the tender white leaves.

This cabbage pest is best controlled by spraying the plants with one of the arsenicals, paris green or arsenate of lead. There is no danger in spraying cabbages with a poison up to the time when they are half grown, and even later. The outside leaves never fold up about the head, hence there is little danger of enclosing the poison within the cabbage. If paris green is used, it should be applied in the proportion of one pound to one hundred and fifty gallons of water, or sifted on dry, in the latter case being thoroughly mixed with flour in the proportion of one pound to twenty-five pounds of flour. This should be applied in the morning, when the dew is yet on the cabbage leaves. Arsenate of lead may be applied in the proportion of two and one-half pounds to fifty gallons of water.

Mother aphis with colony of young aphids

THE CABBAGE APHIS

Appearance of the insect.— The cabbage louse, or aphis, is a small insect with an egg-shaped body covered with a whitish mealy substance. It has long antennæ and sucking mouth-parts in the form of a beak.

Story of its life.— If late in the fall we were to examine carefully leaves of cabbages that had been infested with this aphis, we should almost surely find some of the dark brown eggs of this little pest. The eggs seem to have a thick, heavy covering, and they remain on the old cabbage leaves throughout the winter, exposed to all the vicissitudes of the season. In the spring the eggs hatch, and the young lice find a living for a time, at least, by sucking the juices from the tender leaves of the sprouts sent out by the old stump. In about two weeks another generation of aphids is borne alive by the mother aphids, and in the course of two or more weeks a third generation appears. This rate of increase continues during the whole summer season; for generation after generation is produced as long as the food supply lasts and the weather is favorable. Finally, late in the autumn the shining black eggs are again laid on the leaves, thus completing a very interesting life history.

Injury and control.— The cabbage aphis, like all other aphids, has a

tiny beak, or proboscis, with which it pierces the leaves of the cabbage and through which the juices of the plant are sucked into the mouth of the insect. It is this constant drain on the plant caused by thousands of tiny beaks sucking out the juices that produces the injury. The leaves remain small, become deformed and rolled up, and finally wither and perhaps die. The whole plant remains stunted, fails to head, and so becomes worthless.

The cabbage aphis is exceedingly difficult to control, but the lice can be killed if they are hit with whale oil soap or "black leaf 40," a tobacco extract. Whale oil soap should be dissolved in water in the proportion of one pound to five gallons. The "black leaf 40" should be used in the proportion of one ounce to six gallons of water, but a little soap should be added to help it stick and spread. The undersides of the cabbage leaves should be sprayed in order to actually hit the lice. In the fall all cabbage stumps should be removed from the garden; otherwise they would carry the eggs of the aphis over winter.

THE FLOWER GARDEN

We are hoping that the day will come when in every country home in New York State there will be a few house plants grown each year, and when there will be enough flowering plants in the garden to give a note of joy to all who pass. We hope, also, that the time will come when every rural school building will have near it trees and shrubs and a border of perennial and annual flowers that will be kept in good condition because of the community pride of the young folk. A beginning must be made for such a state-wide movement, and we want you all to help by giving some serious thought to the growing of flowers. It is important that you should do a real piece of work this year so that you will have some first-hand knowledge. We have asked Professor White, of the Department of Floriculture at the State College, to prepare for the next September leaflet for teachers an outline for an entire year's work on flower gardens in rural communities in New York State. This will mean that with the beginning of the school year you can all make a good start, and by the end of the year you will have carried out some work that will be of value to you all your lives.

In preparation for next year's work in flower culture, we want you to look through the list of flowers on page 1075. The teacher will tell you how many of these plants she knows, and you can talk over those that you know. Look at all the garden flowers in the neighborhood during the spring and summer so that you will be able to recognize them easily, and also obtain advice from the growers if you care to have flowers like them next year. You will find many of the old favorites: lilies-of-the-valley,

Canterbury bells, peonies, violets, pansies, English daisies, baby's-breath, hollyhocks, petunias, and a host more. Do not fail to see every garden, so that next fall you will know a good many plants from which to make a first choice when you start your permanent work at home or at school.

There are a great many flowers on the list that you will not find, but you may be interested in looking them up in one of the well-illustrated seed catalogues. Some of these flowers grew in our grandmothers' gardens, and perhaps in the future we may revive an interest in them.

Many boys and girls will grow the flowers listed on pages 1073 and 1074, seeds of which can be bought for two cents a packet; but others may want to try other kinds, and if so, reliable seed houses will sell the seed according to the space you wish to plant, and the catalogues will give prices.

In growing flowers keep in mind the following points:

1. Plan to grow flowers in a border along a fence, a building, or where there will be shrubbery in the background. Do not make a flower bed in the middle of a lawn. Read what Dr. Bailey says on page 1072 about the defects in flower growing.

2. Use good garden soil for your flower gardens. Learn from your father what this means. Handle good garden soil. Learn how to get the right quality of soil in your garden. Perhaps one of the farmers in the neighborhood who is successful in gardening will talk to your school some Friday afternoon about soils for a garden, and let you see samples of different kinds of soils so that you may become skillful in recognizing good quality. A trip with your teacher to some garden that is thrifty will be of value. Plants need suitable soil if they are to be strong and productive.

The best soil for growing flowers is a light loam, a soil about three-fourths of which is sand and the rest clay, silt, and decayed organic matter. The term *organic* is used in connection with forms that have, or have had, life, and should be distinguished from *inorganic* as applied to substances that have no life, such as stone, metal, sand, and the like. The gardener's way of adding organic matter to the soil is by means of manure, which, if applied directly before the flowers are planted, should be well rotted. Your father will tell you how much to apply and how to work it into the soil.

3. Many flower seeds are very small. Be careful not to plant them too deep. See page 1064.

Let every one make an experiment in growing flowers. Do not try to do much this year, for we want you to give your best attention to the vegetable garden; but there will be time for a little work toward flower culture in the future.

DEFECTS IN FLOWER GROWING

Dr. L. H. Bailey in his *Manual of Gardening** says:

"The greatest defect with our flower growing is the stinginess of it. We grow flowers as if they were the choicest rarities, to be coddled in a hot-bed or under a bell jar, and then to be exhibited as single specimens in some little pinched and ridiculous hole cut in the turf, or perched upon an ant hill that some gardener has laboriously heaped on a lawn. Nature, on the other hand, grows many of her flowers in the most luxurious abandon, and one can pick an armful without offense. She grows her flowers in earnest, as a man grows a crop of corn. One can revel in the color and the fragrance and be satisfied.

"The next defect with our flower growing is the flower bed. Nature has no time to make flower-bed designs: she is busy growing flowers. And, then, if she were given to flower beds, the whole effect would be lost, for she could no longer be luxurious and wanton, and if a flower were picked her whole scheme might be upset. Imagine a geranium bed or a coleus bed, with its wonderful 'design,' set out into a wood or in a free and open landscape! Even the birds would laugh at it!

"What I want to say is that we should grow flowers freely when we make a flower garden. We should have enough of them to make the effort worth the while. I sympathize with the man who likes sunflowers. There are enough of them to be worth looking at. They fill the eye. Now show this man ten feet square of pinks, or asters, or daisies, all growing free and easy, and he will tell you that he likes them. All this has a particular application to the farmer, who is often said to dislike flowers. He grows potatoes and buckwheat and weeds by the acre: two or three unhappy pinks or geraniums are not enough to make an impression."

SEEDS FOR CHILDREN'S GARDENS

The following two firms have agreed to furnish seeds under the conditions stated, but children should understand that they are free to get seeds from any source they may desire:

W. Atlee Burpee & Co., Philadelphia, Pennsylvania (A, page 1073)

James Vick's Sons, 189 Main Street, East, or 18-20 Stone Street, Rochester, New York (B, page 1074)

*By courtesy of Macmillan Company.

(A. See page 1072.)

SEEDS FOR CHILDREN'S GARDENS

PRICES: Two cents per packet — postage prepaid.
No order for less than twenty-five cents for twelve packets.
(Special rate — If teachers will send an order for the school and distribute packets to the children, the price will be $1.40 per hundred packets. Express collect.)

SENDER: Any boy or girl may send directly for twelve or more packets.
Parents may send for seed for their children.
Teachers may send for packets for the school as indicated in the special rate above.

Number of packets desired	One packet will sow	Flowers	Number of packets desired	One packet will sow	Vegetables
	If seed is carefully used, one packet will sow ten to fifteen feet of row	Alyssum		15 feet	Bean, bush Lima
		Aster		15 feet	Bean, snap
		Balsam		10 feet	Beet
		Celosia (cockscomb)		200 plants	Cabbage, early or late
		Centauria (bachelor's-button)		15 feet	Carrot
		Dianthus (pinks)		15 feet	Corn, pop
		Larkspur		25 hills	Corn, sweet
		Marigold		18 hills	Cucumber
		Mignonette		20 feet	Lettuce
		Morning-glory		18 hills	Muskmelon
		Nasturtium (climbing)		10 feet	Onion
		Nasturtium (dwarf)		15 feet	Parsley
		Pansy		20 feet	Parsnip
		Phlox		15 feet	Pea
		Poppy		10 hills	Pumpkin
		Scabiosa (mourning bride)		10 feet	Radish
		Sunflower		25 feet	Spinach
		Sweet pea		10 hills	Squash, early
		Verbena		10 hills	Squash, Hubbard
		Zinnia		175 plants	Tomato
				20 feet	Turnip, early or late
				12 hills	Watermelon

Date, ..., 1915

For enclosed remittance of .... you will please forward promptly, postpaid, the .... packets of seeds indicated above.

(Special rate to teachers. For enclosed remittance of .... you will please forward promptly, express collect, the .... packets of seeds indicated above.)

Name .... { Child, age .... / Parent / Teacher

Street address or box number ....

Post office .... R. D. Route ....

County .... State ....

Order blank from Cornell Rural School Leaflet

(B. See page 1072.)

SEEDS FOR CHILDREN'S GARDENS

PRICES: Two cents per package — postage prepaid.
No order for less than twenty-five cents for twelve packets.
(Special rate. One hundred packets for $1.75 postage prepaid.)
SENDER: All orders must be sent through the teacher.

Number of packets desired	One packet will sow	Flowers	Number of packets desired	One packet will sow	Vegetables
	If seed is carefully used, one packet will sow ten to fifteen feet of row	Alyssum		10 feet	Beet
		Aster (our own famous strain)		300 plants	Cabbage
		Bachelor's-button		15 feet	Carrot
		Calliopsis		15 hills	Corn, sweet
		Candytuft		9 hills	Cucumber
		Dianthus (pinks)		20 feet	Lettuce
		Four-o'clock		12 hills	Muskmelon
		Marigold		10 feet	Onion
		Mignonette		15 feet	Parsley
		Morning-glory		20 feet	Parsnip
		Nasturtium (climbing)		10 feet	Pea
		Nasturtium (dwarf)		12 hills	Pumpkin
		Pansy		10 feet	Radish
		Petunia		25 feet	Spinach
		Phlox		12 hills	Squash, early
		Poppy		12 hills	Squash, Hubbard
		Scabiosa (mourning bride)		100 plants	Tomato
		Sweet pea		20 feet	Turnip
		Zinnia		12 hills	Watermelon

Date ...., 1915

Enclosed find .... to cover cost of the .... packets of seeds indicated above.

Post office ....

State ....

School No. .... Grade ....

Teacher's name ....

Order blank from Cornell Rural School Leaflet

SOME COMMON GARDEN FLOWERS

ANNUAL

Ageratum
Alyssum
Aster
Baby's-breath
Bachelor's-button
Balsam
California poppy
Calliopsis
Candytuft
Castor-oil plant
Chrysanthemum
Cockscomb
Cosmos
Dahlia
Dwarf phlox
Everlasting
Forget-me-not
Four-o'clock
Gaillardia
Lobelia
Love-in-a-mist
Marigold
Mignonette
Morning-glory
Nasturtium
Nicotiana
Petunia
Pink
Portulaca
Pot marigold
Scabiosa
Scarlet sage
Schizanthus
Shirley poppy
Snapdragon
Snow-on-a-mountain
Stock
Sunflower
Swan River daisy
Sweet pea
Verbena
Zinnia

PERENNIAL

Canna
Canterbury bell
Columbine
Coneflower
English daisy
Flowering maple
Foxglove
Gaillardia (hardy)
Hollyhock
Larkspur
Lily-of-the-valley
Pansy
Peony
Pink (hardy)
Poppy (hardy)
Sunflower (hardy)
Sweet william
Violet

THE SCHOOL GROUNDS

Each year we have included in the spring leaflet a discussion of the improvement of the school grounds in connection with the Arbor Day

A fine opportunity for attractive planting

activities. While some schools have greatly improved the grounds by the planting of trees, shrubs, or flowers, by the development of fine lawns, and by constantly keeping the school property neat and attractive, there is much yet to be done. This is an important subject, because boys and girls get more out of their school life when the surroundings are attractive, and when they have a share in the development of the school property.

Arbor Day is rather late in the season to do work on the school grounds. Moreover, Arbor Day is usually devoted to some kind of school exercises in which the community shares. There is a tendency to lay greater emphasis on the program than on the work for the improvement of the grounds. It is much better to plant a tree or a shrub so well that it will be sure to live, even though no song is sung or poem recited at the time, than it is to plant it carelessly and have ever so fine a song or a poem. However, it is possible to do both and to do them well.

The planting and other work should be done before the leaves begin to grow in the spring, and for most parts of the State this is some time before the last week in April, depending on the season. Earnest, serious work in planting can be done as a part of the work of the school day. The grounds can be studied, and a plan can be made ahead of time so that

when the right day comes, every one can take part in the work. On Arbor Day, exercises may be held celebrating the improvement of the grounds. By that time, the trees and shrubs will be well started, and it will be a satisfaction to see them actually growing. The exercises will be better if they are not interrupted by heavy work. The spirit of Arbor Day will still be there and will be stronger than ever because the results will be plain to see. Planting and clearing up the yard ahead of time is as important as learning songs and recitations ahead of time. It is part of the preparation for a successful Arbor Day.

We hope that boys and girls will think about this and will talk it over with their teacher. It is time that the schools should begin to see progress as each Arbor Day comes round.

The following suggestions will be helpful in the work of improving the school grounds:

The best trees to plant are elm, sugar (hard) maple, red oak, scarlet oak for dry places, and pin oak for wet places.

The best wild shrubs to plant, given in the order of their size from the tallest to the lowest, are nannyberry, common elder, red-berried elder, red-twigged dogwood, barberry, arrowwood, laurel (evergreen), wild roses, fragrant sumac, and Japanese honeysuckle.

The best wild vines to plant are Virginia creeper and climbing bittersweet.

The best cultivated shrubs to plant, given in order of their size from the tallest to the lowest, are lilac, syringa, ibota privet, Van Houtt's spirea, Japanese barberry, Indian currant, and snowberry.

The best cultivated vines to plant are Japanese clematis, Hall's honeysuckle, and Boston ivy for brick and stone walls.

In general trees should be planted near the boundaries of the school ground, and an occasional tree in some suitable place in the open. No tree should be planted nearer to the building than twenty feet. Whenever possible a tree should be planted on the south or southwest side of the building in order to provide protection from the sun. If the schoolhouse is on an exposed site, trees that are planted on the windward side with reference to the prevailing wind will serve as a windbreak.

Shrubs usually look better planted in groups than singly. They should always have some background, such as a building, an outbuilding, or the boundary fence of the school property. Shrubs should be planted according to their habits of growth, the low ones in the foreground, the medium-sized ones next in order, and the tallest ones in the background.

Vines are used as ornamental screens, and they need something to support them. They are attractive when trained over porches, and they are useful in screening outhouses.

SUGGESTIONS FOR THE PLANTING AND CARE OF TREES AND SHRUBS

PLANTING TREES AND SHRUBS

In planting a tree or a shrub remember a few simple rules:

1. Plant a tree or a shrub before it starts to grow in the spring.

2. Do not dig up the tree or shrub until you are ready to reset it, and never allow the roots to dry out between digging and setting.

3. Dig the tree or shrub carefully and retain a good supply of roots. Trim off broken or split roots, leaving the ends with a clean, sharp-cut surface.

4. Make the hole large enough to receive the roots without crowding, and deep enough to set the tree or shrub about two inches lower than it originally grew.

5. In digging the hole in which the tree or shrub is to be set, keep the surface soil and the subsoil in different piles. After the hole is dug, throw some of the surface soil into the bottom of it. Rich surface soil is better for roots than subsoil. Do not put manure or fertilizer in the bottom of the hole.

6. Set the tree or shrub in the hole and arrange the roots carefully. Be sure to keep the stem vertical, or plumb.

7. Throw in a little surface soil and work it around and between the roots with your fingers, so as to be sure that there are no air spaces left.

8. Throw in more soil and firm it carefully around the roots until they are covered. Then fill the hole, firming the soil constantly. The earth around the tree — except in the case of a fruit tree — should be dished slightly to catch the rain, and the surface should be covered with loose soil that will act as a soil mulch. In the fall the soil around the tree should be leveled in order to prevent water standing and freezing around the tree.

9. Prune the top of the tree or shrub in order to balance the loss of roots. This operation is necessary and must not be neglected because the reset roots are not able to supply food for as many branches as there formerly were. Thin out from one-third to one-half of the branches, leaving the strongest ones to form the framework of the tree.

10. Protect the newly set tree or shrub from injury, and water it thoroughly if the weather is dry.

PRUNING

As in the case of transplanting, pruning should be done before the leaves start in the spring. On the school ground the only pruning necessary will be on fruit trees or on shrubs that have grown ragged and unshapely. Pruning is interesting work because by means of it a tree can be trained into a desirable shape. Remember these few rules:

1. For pruning twigs and small limbs use pruning shears or a sharp knife, and for larger limbs use a small saw.

2. Remove any limb or twig that is growing across another and that, if left, would rub and injure the bark. In deciding between two crossed limbs leave the stronger one or the one that keeps the shape of the tree most perfectly.

3. Always cut off a limb close to the parent branch and parallel with it. Wounds made in this way heal quickly because they are near actively growing tissue. Never leave a stub.

4. Do not have too many branches coming from the trunk of the tree. Four or five are plenty, and will make an open tree that will allow the sunlight to enter.

5. In pruning small branches and twigs, always cut just above a strong leaf bud. The bud will probably grow into a branch and should therefore be on the side toward which you want the branch to grow. By choosing these buds carefully, the tree can be trained as desired.

6. Prune out all dead wood in both trees and shrubs, and in the case of the latter trim the shoots back somewhat so that the shrub will form a well-shaped and compact clump. Always cut above a bud.

GRAFTING

If there is a wild fruit tree on the school grounds, perhaps it will be possible to graft a good variety on it. Do not attempt this work, however, unless some older person in the neighborhood will show you how, and will lend you the tools and the grafting wax. Grafting is the operation of setting a twig, or scion, from one tree in the stem of another in such a way that the twig will unite with the stem and will grow. The twig is called the scion, and the tree is called the stock. Between the hard wood and the bark of a tree there is a layer of tissue which is alive and growing. This is called the cambium layer. In order that a graft may grow, the cambium layer of the scion must touch the cambium layer of the stock. This is the principle underlying all methods of grafting. The following descriptions of whip grafting, cleft grafting, and the making of grafting waxes and bandages were written by Mr. R. D. Anthony and published in a teachers' leaflet some years ago.

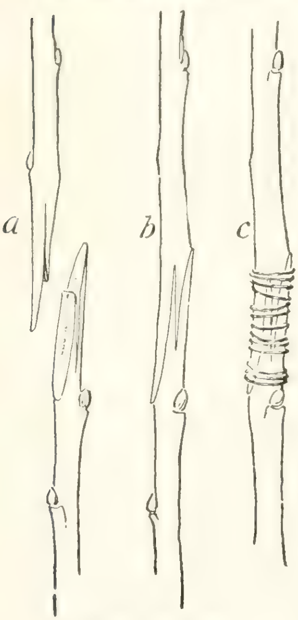
Whip grafting.— The fruit grower may use whip grafting to top-work a two-year-old or three-year-old tree if the branches are not too large to be easily cut. In such a case, the work is done just before growth starts in the spring.

A part of a branch from the previous season's growth is chosen for the scion. The lower end is cut off with a smooth diagonal cut at such an angle that the cut is three-quarters to one inch long. The knife blade is

then placed squarely across the cut surface a little above the center, and a thin tongue, about half an inch, is cut. The scion is then cut off so that it contains three or more buds, the cut being made just above the top bud.

The stock is prepared in the same way as is the base of the scion. The two are then placed together so that the tongue of one fits into the cleft of the other. If the two are of the same size, the cambium layers can be placed together on both sides of the branch; but if one is smaller than the other, the cambium layers are placed together on one side only. The graft is then tied and waxed.

Frequently in the West, and occasionally in the East, the nurseryman obtains his apple varieties by whip grafting the scion on a piece of apple seedling root from three to six inches long. The grafting is done in the winter or early spring.



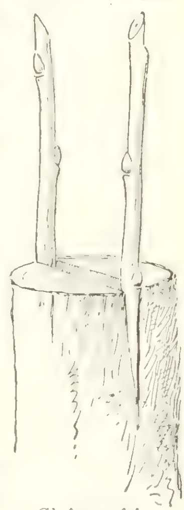
Whip grafting

Cleft grafting.— When a tree is five or six years old and comes into bearing, the grower sometimes finds that the variety is not what he wants, and he wishes to top-work the tree with the desired variety. The tree is too large for whip grafting; therefore cleft grafting is practiced. In early spring before the buds start, a branch is sawed off, and care should be taken that the stock does not split. The stub is then split two or three inches through the center with a grafting chisel or a heavy knife. A one-year-old branch of a good variety is used for the scion, and the base is cut off about an inch below a well-matured bud. Two straight cuts are made; they start on either side of this bud and come out at the bottom in such a way that the base is wedge-shaped from the bud downward, and is somewhat thicker on the outer, or bud, side. This wedge should fit the cleft in the stock. The scion is then cut off just above the third bud from the bottom.

With the narrow wedge on the grafting chisel, or with a wedge-shaped piece of wood, the cleft on the stock is forced open and the scion is inserted so that its outside cambium layer is in contact with the cambium layer of the stock at one side of the cleft. In order to insure this contact, the top of the scion is tipped out a little so that the two cambium layers will cross each other. A second scion is prepared and inserted in like manner on the other side of the cleft. When the wedge is removed the cleft should grip the scions firmly. Since the scion wedges are thickest

on the outside, the contact will be firmest where the cambium layers are in contact; and at this point growth should start. The entire cleft and all cut surfaces should be covered with good grafting wax.

Directions for making grafting waxes and bandages.— In order to make common resin wax, place in a kettle one pound of resin, one-half pound of beeswax, and one-quarter pound of rendered tallow, which is obtained by melting beef or mutton tallow and allowing it to cool. Melt these three ingredients, being careful that the mixture does not boil. When they are completely melted, take the kettle from the fire, and pour the hot liquid into a pail of cold water. Grease the hands thoroughly, and flatten the spongy mass beneath the water so that it will cool uniformly. It is important that it should be removed from the water when it is cold and tough, but not brittle. After it has been taken from the water, pull it as you would molasses candy until it is ductile and fine-grained. If it is lumpy, remelt it, and pull it again. Make the finished wax into balls or small skeins and put them in a cool place, laying them on greased paper so as to avoid sticking.


Cleft grafting

Alcoholic wax is made from a pound of white resin, an ounce of beef tallow, and eight ounces of alcohol. Melt the resin slowly, and when it is completely melted, add the beef tallow. Remove the kettle from the fire, and add the alcohol slowly, stirring constantly. When finished, this wax is a thick paste, and it should be kept in closed bottles or cans.

Waxed string for tying small grafts is made by dipping a ball of No. 18 knitting cotton into melted resin wax before it is removed from the fire. Leave the ball in the wax for a few minutes, and turn it frequently so that it will become thoroughly saturated. After removing it from the hot wax, allow it to drain and dry.

Waxed bandage is made in the same manner as waxed string. A roll of bandage or any kind of cloth is used in place of the string.

Editors' note.— The planting and care of trees and shrubs on the school ground is not only a profitable occupation for boys and girls, but also an interesting one. Faithfully done it will result in permanent improvement to the school property. All of this work is a little difficult to start, but if some one in the neighborhood who understands it could come to the school and give a practical demonstration, it would be the best kind of a beginning. We should like to have reports this year from any schools that do work of this kind.

SEED TESTING

For the purpose of making the work in seed testing more simple in the beginning, we have decided to postpone publishing the first article until next fall. There will then be opportunity to become familiar with the work during the winter, in time for the testing of seeds to be sown next spring. Meanwhile the coming summer may be used to good advantage in collecting and studying weed seeds and the various kinds of farm seeds. We hope every school will supply itself with a tripod magnifier, as was suggested in the January leaflet. It will greatly aid in the seed study. The better the preparation for seed testing is, the better the results will be, and the more quickly they will be realized. Consequently we feel it wise to wait for the opening of the next school year to start the work.

FIVE WEEDS AND THEIR SEEDS

Editors' note.— Descriptions of five weeds and illustrations of their seeds are given below. All of these weeds are very serious pests, and their seeds are frequently found in farm seeds. During the summer it would be well to make a special study of these weeds and of their seeds in order that they be instantly recognized. With the exception of the one of the black bindweed, the descriptions were prepared by Professor Paul J. White, and have been published in the leaflets of former years.

White daisy.— The white daisy is a perennial; therefore it lives more than two years. The roots are rather shallow and branching. The plant propagates itself to a limited extent by means of underground stems. The seeds of daisies are produced in flat-topped heads, which closely resemble the heads of sunflowers. There is a large number of seeds in each head. White daisies are common in pastures and meadows in New York State, and especially in those which have not been recently plowed. During the last weeks of June and the first weeks of July, many fields are white with daisies. They are cut with the grass at haymaking time, and cured with the hay. If cut before they are too old and tough, they are eaten by cattle with apparent relish. In pastures sheep and even cows will eat daisies although they prefer grass and clover. If a field once becomes infested with daisies, the only cure is to plow the soil and grow on it a cultivated crop, such as corn or potatoes, for one or two years.

Grass and clover seed used on the farm often contains daisy seeds. The use of weed-infested farm seeds is largely responsible for the spread of troublesome weeds. Good seeds cost a little more, but they are always safer to use.

Sour dock.— Sour dock is an unsightly weed that is common by the roadside and about farm buildings. It is found also in old meadows that

have not been plowed for several years. It grows from two to three feet tall. Its most distinctive feature is its leaf, which is crinkly at the margins; and because of this the plant has been named curled dock. The tender leaves are often used as greens. The blossoms are greenish with no brightly colored parts. The roots are deep and straight. The small, dark brown, shining seeds are common in clover and grass seed.

Sour dock is a long-lived plant, but it can be easily killed if the plants are plowed up or grubbed up before seeds are formed.

Black bindweed.—Black bindweed is often called wild buckwheat. It is a twining vine with drooping greenish flowers in small clusters. Unlike the field bindweed, or wild morning-glory, which is a perennial, the black bindweed is an annual plant, but it is none the less a very troublesome weed especially in grain fields. The seeds are often found in grain seed. Many of the black bindweed seeds do not germinate until late in the season, and the plant often becomes a pest in corn and potato fields after cultivation has ceased.

1 2 3 4 5

Seeds of five common weeds, natural size and much enlarged: 1, white daisy; 2, sour dock; 3, black bindweed; 4, field bindweed; 5, quack grass

Since the black bindweed is an annual, its spread is controlled by destroying the plants before they go to seed, and by sowing pure farm seeds.

Field bindweed.—Field bindweed is one of the most troublesome weeds in the State. It is not so common as some other weeds, but if it becomes established in a field or a garden, it is next to impossible to free the soil from it.

This bindweed is sometimes called wild morning-glory. The pink blossoms are smaller than those of the cultivated morning-glory. The weed has a twining habit, and when it is abundant it winds around other plants and smothers them. It increases both by seeds and by underground stems. The smallest part of the creeping root is sufficient to start a new plant.

This pest appears most often in rich fields and gardens. It will spread in a circle from a single plant until a whole garden is infested. Many ways of destroying this weed have been tried, but most of them have been unsuccessful. The only sure way to destroy it is to cut the plants off as fast as they appear. Any kind of plant may be killed if it is not per-

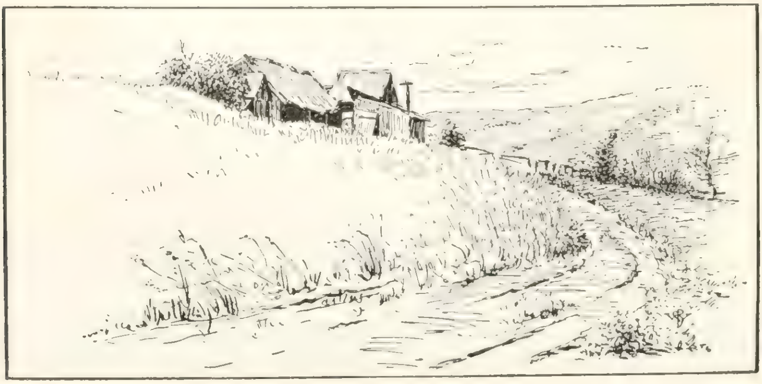
mitted to send stems or leaves above ground. In cultivating a field containing bindweed, care should be taken to avoid dragging pieces of the roots from place to place on the tools. The weed may be widely spread in this way.

Quack grass.— Quack grass is one of the most harmful weeds. If it once becomes established in a field or garden, it is an almost impossible task to get rid of it. It is common in old meadows, in gardens, and in cultivated fields.

Many of the most troublesome weeds have the means of propagating themselves even when they do not ripen seeds. Quack grass is one of this class. It spreads by means of underground stems or rootstocks. The rootstocks are near the surface, and if they are broken in pieces by a plow or a cultivator, each piece may form a new plant. The drag or other implements may carry these pieces from place to place, thus spreading the weed. Quack grass is also spread from farm to farm as an impurity in other grass seeds, and in hay.

The best method of controlling quack grass is by shallow plowing and thorough cultivation. If quack grass is very abundant in a field, stock may be pastured on it until July, or it may be cut for hay before the seeds are ripe. The field should then be plowed and harrowed at frequent intervals until the ground freezes. All rootstocks that are brought to the surface should be gathered and burned. The following year the field should be planted with some crop that is to be thoroughly cultivated. Cultivation will destroy the quack grass that has escaped the plowing and dragging.

Were it not for its troublesome habits of growth, quack grass would be a valuable forage plant. It makes fairly good hay and is relished by cattle when pastured on it; but because it so readily becomes a weed, it is unsafe to plant.



LETTER TO GIRLS AND BOYS

Dear Girls and Boys:

This morning I have taken a long walk so that I may be full of a fresh joy in the out-of-doors as I write this letter to the readers of the Cornell Rural School Leaflet. It is a beautiful day in midwinter with a hint of spring to come. The air is full of the sound of running water and of the distant call of crows. The fields and orchards are resting. The world of the open country seems the finest possession that a person can have.

This is my last letter to you this school year, the fourth year that you and I have known each other through our letters. These years have been good ones, and I hope that there are many more like them to come. We are always sorry when the March leaflet is complete because there is not another until the next November, but this time we have given you so much to think about and do that I am sure the time will seem short.

Read all of the articles carefully, and keep the leaflet where you can take it up now and then and reread parts of it. I wonder how many girls and boys have kept all of the leaflets that they have received in the last four years, and how many look them over once in a while. The surprise in this number is the picture of the Baltimore oriole. Each year in the March leaflet we have sent you the picture of a bird drawn by Louis Agassiz Fuertes, who is one of the most noted bird painters in the world. The pictures are worth keeping carefully and some of you, no doubt, have the three that have been sent in previous years — the red-winged blackbird, the goldfinch, and the bluebird.

There are some suggestions for garden work beginning on page 1056. Springtime is garden time, and I thought as I crossed the fields this morning what a joy it is to take a bit of the surface of the earth and produce fruits or flowers or vegetables on it. Every year I have a garden, and, from the letters that come to me, I know that many of you girls and boys have gardens too. Each year I try to make my garden better than the one of the year previous, and I do not need to urge you to do the same. On pages 1073 and 1074 there are seed order blanks. We recommend the two-cent packet of seed rather than the one-cent packet because the former contains enough seed to make planting worth while. The amount of ground that a packet will sow is given in each case, and you can easily estimate how many packets you will need.

At the school there are things to be done in improving the grounds, and I want you all to read the article on page 1076 and make progress in this work during this year.

On page 1094 there are a number of suggestions for work between now and next fall. Each one of you should find there something to do that will give you new knowledge and capacity. There are other things that you

will find in the leaflet if you look for them: the little story of the bird notes, and the page of bird quotations; the list of garden flowers; descriptions of five more weeds with pictures of their seeds; the articles on the house fly and the house mosquito; and the various letters from the girls and boys.

The letters I am sure you will read carefully, for I learn from your letters to me that you find them among the most interesting things in the leaflet. Some of you will want to carry out the suggestion of writing to another school, which we make on page 1093. It will take a little time to get this started, but it will surely be worth while, and I know of nothing that will be more interesting.

The note to the older boys and girls on page 1093 should not be overlooked by those of you who complete the work of the grades or who leave the rural school this year. The advanced list is growing, and those whose names are on it are a fine group of young persons living in the open country and anxious to help in any way in their power. We expect great things from them in the years to come.

During the spring and fall many of you will take trips with your teachers to the woods and fields or to neighboring farms. Such trips are a valuable part of your school work because they add life and interest. I think that sometimes girls and boys do not fully realize that they are as responsible to the teacher on the occasion of trips afield as they are in the classroom; on the contrary they should feel greater responsibility because out in the open greater effort has to be made by each one to keep with the group and to give attention. Whenever there is something to be discussed, all should hear it in order that the whole matter may not have to be repeated to some one who had strayed off or been inattentive at the time. A very short trip will afford a great deal of new information if the most is made of every minute.

There is one message that I want to send to you girls and boys in this letter. In other letters we have talked about our health, our habits, our work, and our play, but we have never spoken about the thing I have in mind now. It is the fact that we may keep putting off some thing that we mean to do and want to do until, in the end, it is never done at all. I am sure, from what I have seen and heard, that there are letters written to me that are never sent; that some of you mean to write but do not get around to it; that ears of corn selected to represent the school at Farmers' Week never leave the schoolhouse; that prize ears returned are sometimes left unplanted; that gardens that have been planned are not planted because seeds are not sent for in time; and so on. Now, this is not a criticism of any particular school or person, because we all fall into this error of putting things off, and the only way to conquer it is to keep

fighting against it. The old saying that we see often in mottos, "Do it now," is a good one when we really stop to think what it means. Therefore, whenever we have an impulse to do some good and worth while thing, let us do it at once, and it will be astonishing how much we accomplish.

Very often we hear it said, "Oh, I haven't time." Perhaps we have said it ourselves. If we think a minute we will see that what we mean is that we do not care to take time for the thing in question. We need constantly to use our time so that we shall always be doing the most worth while thing. No little thing that we have decided to do should stand in the way of a bigger thing that presents itself. The only limit that we have is that of duty, which may sometimes necessitate our doing what seems to be the lesser thing. In this case, however, the doing of it often gives it greater value.

Perhaps, at first, you will not understand what I have just written, but if you will read it over now and then during the next few years, I think you will come to see what I mean. It is a fine lesson to learn.

It is time to say good-bye. I shall be thinking of you all during the time between now and next November. Perhaps I shall see and talk with some of you. At any rate I shall look for your letters, and expect to find in them a report of the good things you are doing, and how you are growing day by day in knowledge and in friendship for the world of nature and of folk.

Your friend,

Edward M. Tuttle

LETTERS FROM GIRLS AND BOYS

District 9, Town of Otsego, Otsego County

Cooperstown, New York, December 22, 1914

Dear Mr. Tuttle:

I am going to write and tell you about our chickens which were raised on the school ground by the boys in this district.

The hen and eggs were given to us by a man who took a great deal of interest in our school. The hen was set on fifteen eggs in a dark corner of the woodhouse. Everything went all right until one day the door blew open, and the hen went outdoors for a long time. We were all very much frightened and afraid the eggs would get cold and would not hatch, but we let her have her own way. After a time she went back on her nest. When school was out we closed the door and she was all right again. We fed her every day and gave her fresh water.

One morning in June when the three weeks were up we heard some chickens calling. We went out and she had hatched fourteen of them all safe. One of them was under a board and could not get out. We took it out and thought it would die, but it did not. We put the hen and her family in a box and tied a string to her leg. During the day we opened the box and let her out. We commenced to feed them bread and milk and other things from our dinner pails for a while, then cracked corn, then whole corn, which we have fed them ever since.

They grew very nicely during the summer. I live near the schoolhouse and I took care of them during the summer. We took them to the county fair and received five dollars which was the first prize.

The flock of plymouth rocks at District No. 9

We have not planned what we will raise next year, but think we will raise some corn and potatoes. The girls are going to set out flowers, and have flower beds.

Sincerely yours,
GEORGE B. MORE

Editors' note. — George writes an interesting letter about a piece of work that is worth while. Raising this flock of plymouth rock chickens at the schoolhouse was valuable experience. What an opportunity there was to study the habits of the hen during the three weeks that she was sitting on the eggs, to watch the young chicks growing day by day from the time they left the shell, and to read in poultry journals and books about the best methods of feeding and caring for such a flock! It was responsible work, too, for the chickens had to be cared for regularly and faithfully. From their appearance in the picture, and from the fact that

they took a prize at the county fair, it is evident that they had good care. As a result of this experience the boys and girls have a better knowledge of what to do and of what not to do in raising chickens, and they will be able to use this knowledge in taking care of the home flocks. Another year this school is going to raise a farm crop, and each year there will be some one definite piece of work done at the school that will be valuable in pointing the way for home work. In this way school and home will be brought together by practical work.

District 4, Town of Wilton, Saratoga County

Wilton, New York, May 27, 1914

Dear Mr. Tuttle:

I am writing my third letter, but I am not writing to get the picture. I am writing because I like to write and tell you what we are doing, what we have done, and what we are going to do.

I will tell you what we are doing with our yard first. The boys of the school are making a place all along the yard to set out trees. The district let us send to get trees to make a hedge around the yard. The scholars were going to do it at first. We were going to all put in together and get money enough to do it, but the district volunteered to get them for us, so we will not have to get them. It is quite a hard task for the boys to do what they have started. They have dug a solid trench about two hundred feet long. They are very faithful at their work. We have got two window boxes all ready to put plants in them. The boys made the window boxes for us. We are going to have plants from the greenhouse to put in the window boxes. Our yard looks quite bad this spring because the railroad is right back of the schoolhouse and all the rubbish from the unloading of the cars came over on our school yard, and the teams drove on the yard. But now we have got it so they do not drive on it any more. We took an afternoon off and raked the yard so now it looks a great deal better.

A gentleman gave us grass seed and sowed it on the yard for us.

We have two hanging baskets fixed for the porch.

The scholars got up a soap order to get a bookcase to put our library in, and then we took the old bookcase to put the specimens in which we collected; we have quite a few things in our collection now. We have birds' nests, different kinds of bark, leaves, different kinds of Indian arrowheads, galls, evergreen cones, ores.

We have a bird chart, and it is the first one that we have had in our school. We were not very much interested in it at first because we did not think there were so many kinds of birds around our place as we have seen. Our teacher told us the reason was that we did not have sharp eyes before and did not see all the different birds. Some of the pupils in the school said that we would not have more than fifteen birds reported, but we have thirty-four reported already.

I have seen more birds this year than I ever saw in my life before. I have kept a good lookout for the birds ever since I wrote my first letter to you. I am interested in the birds and all nature study more than ever

before. We have had very nice times in our Audubon society since we have learned what good the birds are to the people and that they do not do any harm to people.

The boys who persevered in making the trench for the hedge

We have a bird for discussion in every meeting. We also have had a few animals to study. Some of the birds that we have studied are the English sparrow, bluebird, purple grackle, song sparrow, mourning dove, vesper sparrow, and the kingfisher. We have had other birds, but I cannot think of the names just now. The animals that we have studied are the fox, coon, weasel and wolverine.

We have been on a few walks this year, and they have been very interesting because we have learned so many things about nature that we did not know.

I wish that you would come to our schoolhouse and see what we have done this year. This year of school has been the most interesting year of school that I have ever had. I am very sorry that we cannot have the same teacher next year of school that we had this year because we all like her very well and she makes everything interesting.

We have had the picture taken of the schoolhouse before we got it fixed up and if we get the picture after the hedge is set out and our window boxes fixed, I will send the pictures to you if you would like them.

We have only two weeks more school after this week. I am glad it is near vacation time, and yet I do not like to see our teacher go.

Well, I think I have told you all that we are going to do so will close for this time. Hoping to hear from you soon.

Yours sincerely,

ANGELEAN E. DEYOE

Editors' note.— The letter from Angelean tells its own story. Here is a wide-awake school, constantly doing things to improve the grounds, the building, and the equipment, and to increase the pupils' knowledge and interest. Behind it all there was a good teacher with whom, rather than for whom, the boys and girls worked. We are sorry that she could not stay to carry on the work another year, but we feel sure that with such a start each year will be full of new and valuable experiences for the children. We would like to receive more letters telling of work of this kind.

District 11, Town of Lisle, Broome County
Marathon, R. D. 4, New York, December 15, 1914

Dear Mr. Tuttle:

My teacher and superintendent are anxious I should write you a letter in regard to rabbits so I will do my best.

I have about thirty rabbits and enjoy their company first-rate. I have all colors and all sizes. Some are black, some white, yellow, maltese, and striped ones.

My rabbits are usually larger than the common gray rabbits of the forest and when I wish to pick one up I usually take it by its long ears, and they will curl up their little bodies like balls. My rabbits have very long hind legs, too.

When a rabbit hears a noise like danger he moves his long ears as fast as he can to locate the sound and when he moves away he always uses his long hind legs to jump with. He always leaps and never runs.

The rabbit's nose is always sniffing, too, and this helps him to avoid danger. Their eyes are very bright and round, and the white rabbits have pink eyes. The others have very dark eyes.

Did you know that rabbits have hair on the bottom of their feet? What is that for?

They eat their food from the ground or from dishes or even your hand.

My rabbits dig holes in the ground but not very deep ones, and these they use for nests for their little ones. They line them with fur from their bellies, and grass and weeds which they pull, and when the old mother rabbit leaves her babies for a little while she covers them up with this hair and grass. When a rabbit is three or four weeks old it can run very fast.

Rabbits have two long teeth in front to gnaw with. It is these they use when girdling young trees, and they have a little crease in the upper lip so these teeth can work better.

This fall I had an old mother rabbit die and leave seven little ones. These little ones were taken in by another mother rabbit that had seven of her own about the same age and she and I together raised these rabbits until they were old enough to wean. My mother let me keep them in the kitchen behind the stove where it was warm, and it was lots of fun to watch the old rabbit eat. It is amusing, too, to hear and see rabbits drum with their hind legs to let the others know of danger coming.

I think I have made you tired, but when I talk of rabbits I am wound up.

Yours truly,

BLENFORD HAMILTON

Editors' note.— One of Blenford's schoolmates wrote us that he was especially interested in rabbits, and so we asked him to tell us about his experiences. His letter makes interesting reading and is full of observations that show his careful study of his pets. We are always glad when a boy or girl does a piece of work well. It makes little difference what the work is, so long as it helps the boy or the girl to grow in character and in the capacity to take responsibility.

We have had Dr. Allen read Blenford's letter and thought that some of his comments might interest the boys and girls. He said that the hair on a rabbit's feet is for protection and is a special provision made in the case of some of our smaller animals that live wholly on the surface of the ground. He said, also, that in addition to the drumming that rabbits make when nervous, they will give a single sharp stamp with one hind foot before starting to run after being frightened. Dr. Allen mentioned the difference between the true rabbits and the hares, or cottontails. The domestic rabbits, such as Blenford has, belong to the true rabbits and probably came originally from the Old World. They differ from the hares, which include our wild " rabbits," or cottontails, in that they dig a shallow hole to make a nest. Hares make a nest on the surface of the ground.

A LETTER AND TWO SUGGESTIONS

District 1, Town of Kirkwood, Broome County
Great Bend, Pennsylvania, December 7, 1914

Dear Miss McCloskey and Mr. Tuttle:

We, the pupils of District 1, Town of Kirkwood, County of Broome, would like you to know what pleasure we took in the ear of corn that our superintendent, Mr. Hurlburt, brought us from Cornell. The ear of corn came from Honeoye Falls, Monroe County. We shelled the corn and gave the resident farmers each a tablespoonful in little boxes which we made for drawing. One of the farmers took interest enough to plant the corn and keep it separate, and found that he had forty-two ears of corn. After we had distributed the corn we wrote letters to the pupils of that school, and what interesting letters we did receive in reply! They told us what farm products and different fruits they raised and how to play some of their games. Friday we observed Corn Day. The ear of corn that I had came from the seed taken from the ear from Honeoye Falls. My ear took the prize.

Very truly,
MILDRED CONKLIN

Editors' note.— We like the letter Mildred writes in behalf of her school. It contains two definite ideas.

The first idea is that something worth while was done with the ear of corn that the pupils of another school selected. Their efforts were

not wasted. Moreover, because this ear was well chosen, it produced good corn, and an ear of it represented the Broome County school at this year's Farmers' Week. Corn Day will mean a great deal more when there are many schools taking the interest shown in this letter. We hope that you will keep track of the ear of corn sent by your school this year if any one writes to you about it. Perhaps it won a prize and has been returned to you. If so, be sure that some one plants it this summer and takes good care of the crop, for seed from such an ear becomes better and better each year. Perhaps you have had a letter from a farmer or another school telling you where your ear of corn is. If so, do not fail to keep in touch with them. At any rate, keep track of the corn selected from year to year in order that the work you do in selecting good ears on Corn Day may be put to some good use.

The second idea in Mildred's letter is that her school and the school in Monroe County wrote to each other and became acquainted in this way. For some time we have considered suggesting to schools in the rural districts that they write each year to some schools in other parts of the State. This would be not only interesting, but it would help you to become familiar with farming conditions in various sections, and you could tell each other about your school and home life. You could also exchange information about the various industries in your locality and about the geography of the region.

We shall be glad to introduce your school to some other school if you write us that you would like to have us do so. Should you have any preference for corresponding with a school in a particular county, we shall try to meet your wishes if we can. In writing to us, do not fail to give your district number and township, and the name and address of some one in your school who will be sure to receive the letters, preferably one of the older pupils who is likely to be there during the whole year. All of the pupils in one school should write to all of those in the other for a year. Another school in a different section may be added the second year, and so on. Discuss this matter with your teacher. She will be glad to help in starting the correspondence.

TO THE OLDER BOYS AND GIRLS

There will come a day when you will leave the grades or the rural school, either to go to high school or to go to work. We have been such good friends through the leaflet that it is too bad for us to cease to keep in touch with each other. If you are interested, suppose you send us your name and address for a special list that we will keep, and in return we will write to you occasionally, and send you whatever publications from the College we think would be of interest and of help to you.

As you grow older you will be in a position to do much for your own and other rural schools. We know of a rural school where every time there is an entertainment or some special occasion for a community gathering, a large number of boys and girls fourteen to twenty-one years old come back and help to make it a success. These are those who have gone ahead, but who still keep fresh the memory of their first school and have a desire to see that it prospers. We know that in the years to come there will be more and more of this, and that you will be loyal to the school that has given its best service to you. In order that you may help intelligently, you will need to know some of the things that the elementary schools are doing and planning, and it will be a pleasure to us to keep in touch with you as closely as we may, and through you to strengthen the schools of the State.

Therefore be sure to write to us when you leave the grades or the rural school, asking to have your name placed on the Advanced List. Address the Editors of the Cornell Rural School Leaflet, New York State College of Agriculture, Ithaca, New York.

SOME THINGS TO DO IN SPRING, SUMMER, AND EARLY FALL

1. Make a calendar of the wild flowers as they appear this spring. If you find any that you cannot identify, leave a blank space, and send a specimen to the College to be named. Try to find all that are given for study this year — geranium, hepatica, strawberry, goldenrod, bluet, columbine, bloodroot — for this will be a definite piece of work; but do not neglect to list any others that you may see. In a few years you will know when to expect each of the wild flowers in your neighborhood, and this is always interesting. We are wondering who will find the first hepatica and report its coming? the first wild geranium? Who will be able to tell the teacher in the fall when the first goldenrod was in full bloom?

2. You may prefer to make a calendar of the time of the flowering of the trees. This will be exceedingly interesting. Perhaps no one in your class can tell when the chestnut tree will blossom, although every one of you can tell when the chestnuts will be ripe. Find out when the first blossom of apple, plum, beech, elm, locust, birch, chestnut, and cedar appears.

3. The study of ferns is always full of interest, and although a large part of their life history must be left until you are older and can use microscopes, very young persons can learn much that will give new joy in the woodland places. The dark wood banks that call you by the ferny

odor, and the strange little fern forms creeping out from among the rocks — all have some story, and the young and patient observer can read it.

A good quest will be to find out how many different kinds of ferns you can recognize. Notice how and where the spores, which correspond to the seeds of flowering plants, appear on the ferns. Do you find them on central spikes or on the backs of the fronds (leaves)? Have you ever found spores on cultivated ferns? Notice the differences in the way the fronds are cut. Plant a small fern in soil from the woods in a dish on the teacher's desk or on the table at home. There is no more attractive centerpiece for the dining room table than a fern.

4. Be able to tell us next year what you have done in helping to destroy two of the most injurious insect pests, the house fly and the mosquito. Read carefully the articles by Professor Herrick on the house fly and the mosquito on page 1097. So harmful are these two pests that every one should help to keep them in check. Continue your study of the tent caterpillar. Watch for the cocoons of the tent caterpillar, collect some of them, and keep them until the fly-like parasites hatch, as was suggested in the January leaflet, page 1052. The report to date on collecting the egg rings is that 1,846 schools have collected 4,090,442 egg rings. Allowing 150 eggs for each ring, 613,566,300 eggs have been destroyed.

5. Learn one or more of the bird quotations in this leaflet, page 1055, and you will be very glad some day that you have done this.

6. Plant a tree or help to plant one. Take this piece of work seriously. Plant the tree at the right time, in the right place, and be sure that the tree is one that will be satisfactory when grown. See page 1078. You have enjoyed the trees planted by others years before you were born — the old apple-tree where the swing hangs, the maple or elm that gives you shady places, the butternut tree, and the fine, old hickory. What will you plant for others to enjoy?

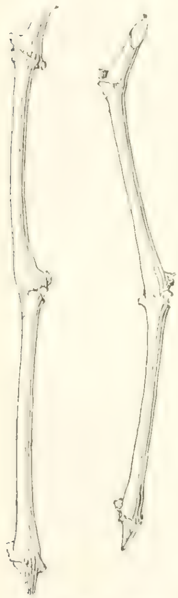
7. Graft a tree for your very own. Have your teacher or your father help. Read directions for this on page 1079.

8. Plan to have your own grapevine. You will find interest in it even if you have to wait two or three years for the fruit. Some day we are planning to ask every boy and girl in the rural schools to plant a good grapevine, and perhaps the report of your experience will help them. You cannot plant your grapevine until fall, but there is always much to be done before growing any new plant. You should know its habits of growth, its favorite situation, the soil best adapted for it, and, above all, the varieties that grow best in your locality. You probably know who has the best grapes in the neighborhood. Consult the grower. The article on the next page will help you to start the grapevine properly and should be read carefully.

GROWING GRAPEVINES FROM CUTTINGS

C. E. HUNN

All grapevines that are used for vineyard purposes are grown from cuttings, and it is only to obtain new varieties that vines are grown from seed. The reason for growing the vines from cuttings is that by this method one is sure to have the identical variety wanted, while in growing vines from seed one cannot tell whether the resultant vine will have good or poor fruit. It will be what is called a "seedling," or "natural fruit."



Grapevine cuttings

Grape cuttings are usually made late in the fall after the leaves have dropped from the vines and after the summer's growth of wood has become firm and well ripened. Always use wood of the last summer's growth, and select the best developed portions. It is better to discard the ends of the shoots, for they are usually only partly ripened. The cutting should have three joints, or nodes. Make the lower cut just below the lower node, and leave a short piece of the cane projecting above the upper node in order to protect the bud. These cuttings should be set in the ground in the fall, having the two lower nodes in the soil and the upper one above. A little straw or manure should be placed over the cutting during the winter and taken off in the spring. The cuttings will produce roots and grow the following summer, and the second year they may be planted where the vines are to remain permanently.

If the vines are grown on a trellis, they should be planted nine or ten feet apart; but if they are to cover an arbor, they should be planted closer — about six feet apart on both sides of the arbor. One should be able to obtain grape cuttings from persons near who have growing vines, for the wood used for cuttings is usually cut from the vines in the annual pruning and thrown away.

Start with a few of the best-known and strong-growing varieties, such as Concord, Worden, Niagara, or Catawba. Afterwards choicer varieties may be added.

Grapevines thrive best in a gravelly loam soil, but they will grow well on heavy soil if there is good water drainage under the roots.

TWO HOUSEHOLD PESTS

GLENN W. HERRICK

THE HOUSE MOSQUITO

Appearance of the mosquito. — The house mosquito is a small fly with two wings, long, slender legs, and a slender proboscis, or beak, with which it penetrates the skin and sucks the blood. The male mosquito has hairy appendages on the head, but does not " bite."

Story of its life.— The house mosquito lays its eggs in boat-shaped masses, which float on the surface of water in rain barrels, tin cans, ponds, streams, and pools. The masses of eggs are dark brown, and look like minute specks or soot floating on the water. In one or two days the eggs hatch into tiny wigglers, or larval mosquitoes. These wigglers, or wrigglers, are very active, but they have a tube on the end of the body through which they take in air, and therefore they rest during a part of the time near the top of the water with the head hanging downward and the tip end of the tube projecting into the air. In about a week the wigglers change to pupæ, which appear to have large heads and slender tails.

The pupæ live for four or five days, when the skin breaks open along the back and the mosquito crawls out, dries its wings, and flies away.

Control.— Drain all pools and ponds of water, and empty tin cans and rain barrels in which mosquitoes may breed; or pour oil on top of the water, which will kill the wigglers. Sometimes small fish, such as minnows, can be put into ponds and pools, and these will destroy the wigglers. The windows and porches of houses may be screened as a protection from the annoyance of mosquitoes.

THE HOUSE FLY

Appearance of the fly.— Several kinds of flies are often mistaken for house flies. The house fly varies in size according to the quantity of food that the maggots obtain and to the temperature surrounding them while they are growing.

The house fly is grayish brown in color, with four dark lines on the thorax just behind the head; and one of the main long veins in each wing turns abruptly upward at the end. The body and the legs are covered with rather long, stiff hairs.

Story of its life.— The small, white, slightly curved eggs are laid in decaying vegetable material, especially horse manure. They hatch in twenty-four hours into maggots, which reach their full growth in five or six days and change to dark brown objects known as puparia. The pupæ, inside the puparia, rest quietly for about five days, and then transform to the adult flies. There may be eight or ten generations each season — each generation, of course, containing more flies than the preceding one.

Injury and control.— House flies are known to be carriers of typhoid fever, cholera, dysentery, and other intestinal diseases, and are therefore very dangerous insects to allow in the house.

All stable manure should be drawn to the fields once a week, or put in a dark, tight room or pit. The closet or outhouse should be tight so that no flies can enter it. The windows to kitchens and other rooms should be screened against flies. Flies should be caught in traps or on tanglefoot paper, or killed with formalin baits. Two tablespoonfuls of formaldehyde (40 per cent) in a pint of equal parts of milk and water, set about the room in plates, will attract the flies and kill many of them, provided there is no other food or water for them to feed on. A piece of bread placed in the middle of each plate for the flies to alight on will make the bait more attractive. A constant warfare should be maintained against house flies.

Editors' note.—Ask your teacher to let you see the illustrations of the mosquito and the house fly in the various stages of their development. They can be found on pages 147 and 148 of the September leaflet.

An adult house fly. Much enlarged

CORNELL RURAL SCHOOL LEAFLET

PUBLISHED BY THE DEPARTMENT OF RURAL EDUCATION, NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

VOLUME IX ITHACA, NEW YORK, SEPTEMBER, 1915 NUMBER 1

THIS ISSUE IS FOR TEACHERS

SUBJECT MATTER IN NATURE STUDY AND IN ELEMENTARY AGRICULTURE FOR 1915-1916 AS OUTLINED IN THE NEW YORK STATE SYLLABUS FOR ELEMENTARY SCHOOLS

Entered at the post office at Ithaca, New York, as second-class mail matter

Cornell Rural School Leaflet

PUBLISHED BY THE DEPARTMENT OF RURAL EDUCATION OF THE NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY, ITHACA, NEW YORK

STARLIGHT

STARLIGHT

L. H. Bailey

I slept night long in the starlight
Under the calm great sky;
The cool of the depths was about me
As the silent hours went by.

The day had been one of dejection
It had followed me on to my rest,
And I took me out to the starlights
When the day went down in the west.

Often I woke from my slumber
And the silent stars were there,
In passionless steadfast legions
On guard in the welkin bare.

Under the gleam of the starshine
Motionless long I lay,
Knowing at last I had mastered,—
As calm and as silent as they.

CORNELL RURAL SCHOOL LEAFLET

VOLUME IX ITHACA, NEW YORK, SEPTEMBER, 1915 NUMBER 1

FOREWORD

THE EDITORS

The purpose of this number of the Cornell Rural School Leaflet is to give to the teachers of New York State subject matter that may be useful in teaching nature study and elementary agriculture as outlined in the New York State Syllabus for the year 1915-1916. No teacher is expected to make use of all the material presented in the following pages; but according to the ages of the boys and girls and the amount of interest and inspiration that a teacher has in the subjects, a selection from the articles may be made. The various topics are presented by specialists who, from their knowledge, have given what they consider important in their lines of work in the education of children.

The leaflet is made up of two parts. In Part I will be found subject matter that will be helpful in teaching nature study and elementary agriculture as outlined in the syllabus. In Part II is given some material that will doubtless be suggestive to many of the rural teachers who have special interest in outdoor study.

In order to make the country-life instruction in the public schools of greatest value, the following should be considered:

1. Nature study is the study of nature. Every boy and girl should be encouraged to find education and resources in the out-of-doors. They should know the wild life about them — the birds, the trees, the flowers, the weeds, the insects, the animals of field and wood. They should take interest in the soils, the rocks, the brooks, the hills, the woodlot, the forest. They should learn to love the music of the wind, the soughing of the pines, the clear, true starlights, the restfulness of rains, and the magic of the snows. Love of nature is a valuable asset in the lives of farm folk.

2. Agriculture is a dignified industry that, for its greatest development, must be founded on science. Boys and girls even in the elementary grades should be taught to seek the truth in all that has to do with farm experiences and practices, and to turn to scientists for information that relates to farm problems. They should know who are investigators along the many lines of scientific agriculture in state and national institutions, and why they have the right to receive help from these persons.

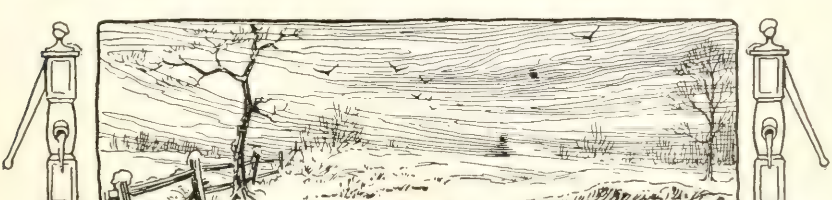
3. Agriculture should not be taught from a printed page. The boys and girls should enter during each school year some agricultural activity, such as the making of a school or home garden, a farm or home project, an exhibition of farm products, the planting of school grounds, or the

like. Books and bulletins may be used for reference and suggestion, but the real education in this work will result from actual experience in the out-of-doors. The school enterprise must be planned in such a way that it will appeal to the young folk as important. Farm boys and girls are not much interested in doll gardens on the school grounds.

In country districts there is much need of a home garden on the farm, and the boys and girls should take care of this. Fresh garden vegetables for the home table will contribute to the well-being of the family. The teacher who encourages this effort is doing a fundamental work in a community. There is need for a home fruit-garden. An interesting work would be to find out the most desirable variety of grape for the locality and teach the children how to procure and plant a cutting.

Boys and girls, with help at home and the encouragement of the teacher, can do much in raising poultry. Some teachers have fostered a small poultry enterprise at the school. This has aroused interest in home poultry.

It is not the amount but the character of work done in nature study and elementary agriculture in the rural school, that is important in education. Studies in these subjects for young children should lead to out-of-door interests and activities, in which the boys and girls take part because they enjoy them. Teachers often hesitate to introduce such subjects from a mistaken feeling that the children may know more about them than the teachers themselves do. It is true that many boys and girls have some knowledge of the natural world and of agricultural practices, but, for the most part, this knowledge is superficial and general, and they need to see that there is much that they have never learned. Teachers and children can work together and learn together, and this is, perhaps, the very best way. A large number of rural teachers are accomplishing excellent results by suggestion and encouragement in this work for the most part outside of school hours. Simple competitions in outdoor quests in natural history, and in some farm or home practices, will bring a wholesome interest into the schoolroom for days and often for weeks, and will result in a closer relation between the children and their surroundings. If encouragement is given in practical lines of study, the parents will often become interested, and the school and the home will be working together in the education of the boys and girls.



PART I

LIST OF SUBJECTS FOR 1915-1916 IN NATURE STUDY AND IN ELEMENTARY AGRICULTURE AS OUTLINED IN THE NEW YORK STATE SYLLABUS

BIRDS

For special study, the chickadee and the hen; to be recognized, any two of the winter birds and any five of the following: bluebird, chipping sparrow, brown creeper, barn swallow, pewee, oriole, hawk, crow, flicker, Maryland yellowthroat.

ANIMALS

For special study, the horse and the cow; to be recognized, any four of the following: donkey, deer, turtle, field mouse, squirrel, woodchuck.

INSECTS

For special study, the monarch or (for Adirondack region) the sovereign butterfly, and one biting and one sucking insect; to be recognized, any four of the following: grasshopper, wasp, cricket, potato beetle, house fly, luna moth, dragon fly.

PLANTS

For special study, the corn; to be recognized, one of the clovers, one of the grains, one of the grasses, and any six of the following: violet, pansy, aster, milkweed, skunk cabbage, claytonia, poppy, pear, lady's-slipper, sweet clover, cabbage, carrot, also any four of the following weeds: burdock, white daisy, shepherd's purse, wild carrot.

TREES[1]

For special study, the oak and one conifer; to be recognized, two kinds of fruit trees and any five of the following: American hop hornbeam, or ironwood, arbor vitæ, aspen, butternut, catalpa, sassafras, shadbush, sycamore, witch-hazel.

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[1] There is no tree work outlined in the syllabus for this year, but in this leaflet is given some material on common trees in which many of the schools of the State are interested.

BIRD STUDY

THE EDITORS

IN preparation for bird study for 1915-1916, teachers should read over the material in this publication and make simple plans for the year's work, both as to method of instruction and as to results to be accomplished. This does not mean to have outlines made to be followed by the children, for nature study should be largely spontaneous. Instead of following outlines in bird study, the birds themselves should be followed. It is very important, however, for the teacher to decide what will be most helpful in leading the boys and girls to make the right kind of observations.

No one should plan to do too much, but should consider the following suggestions carefully, and perhaps use one or more of them in outdoor teaching.

1. As you read over the articles on birds in this leaflet, write down in your notebook some things that you will be able to work out with the boys and girls. During your reading you will get a fairly good knowledge of the possibilities of educational work connected with the birds for study this year. You may not know these birds, but when your interest is once aroused, the knowledge comes easily and rapidly. Some teachers have known only a few of the commonest birds at the beginning of the school year, but with the aid of the children they have become familiar with twenty-five, thirty, and even a larger number before the close of the spring term.

2. Make a list of the birds given for this year's work that you do not know. Try to become familiar with the descriptions of these birds, so that if you should come across one of them you would recognize it. Encourage the boys and girls to help.

3. Have a canary at school some day. Caged birds are most unsatisfactory to any one who has associated with birds in the open, and from the experience with the canary a desire to leave the birds free, and yet have their companionship, can be encouraged. Any stories that you know of the experiences of bird lovers with wild birds will be valuable. Often some of the shy birds will respond to human kindness and become very friendly (page 1114).

4. The boys and girls will take an interest in making bird houses. At least one should be placed in every school yard in New York State. Some of the most attractive birds, such as the bluebird, the wren, and the purple martin, will build in houses. In view of the fact that children

are often awakened to interest in work that will attract the attention of the public, some competition in bird house structure among the schools of a supervisory district is suggested. The bird houses might be made and exhibited at the county fair, and then placed on the school grounds to become well weathered before the birds return the next spring. On this page will be seen an exhibition of bird houses made by the boys and girls in Saratoga Springs. A thousand were completed, nine hundred of which were of suitable material, and carefully made as to size, location of entrance, and the like. A supervisory district could doubtless do as well. There might be competitions in this work among the supervisory districts in a county. Then there would be a more complete exhibition of bird houses for the county fair.

Exhibition of bird houses at Saratoga Springs

5. The children should have knowledge of the economic importance of birds, and a study of the feeding habits will help in this. They should be taught to feed the birds during the winter.

6. A collection of old nests always has an interest for the children, and much can be learned from them. The care with which some of the nests are made, the materials that are used, and the like, increase observation as the children study them. Many mounted nests were sent to the State College of Agriculture for the exhibition held during Farmers' Week. In giving the description of birds' nests for identification, the following points, prepared by Dr. Allen, should always be considered:

Size:

a. Diameter, inside and outside
b. Depth, inside and outside

Material:
- a. Outside
- b. Inside (lining)
- c. In some nests, as the robin's, there is a middle layer; this also should be described

Location:
- a. General environment — woods, hedgerow, orchard, and the like
- b. Name of tree or bush in which placed, as apple tree
- c. Location in tree or bush, as end of branch, near trunk, and the like
- d. Height above ground

7. Bird Day in the schools is to be observed each year early in April, as directed by the University of the State of New York. On this day the work done in bird study during the year may be summarized and reported to the older folk of the district. The value of birds to the farmer should be emphasized at this time, and attention may be called to birds of particular local interest. The bird houses located on the grounds should be shown to the visitors, also the feeding station that has been kept supplied during the winter, and a list given of the guests that visited it. Each pupil might learn one of the bird quotations given on pages 1137 to 1139. Designs made by the children for a bird calendar might be exhibited. If outdoor conditions are favorable, an open road trip or a field trip would be interesting. A record of the trip should be kept, which would include a list of the birds seen and heard.

8. A few birds seem to be exceedingly destructive in some localities; even the robin has a very bad reputation in one or two sections of New York State. If this is the case in your community, why not start the children making some investigations before the birds are destroyed, and let them take up the matter with Dr. Allen, who has charge of ornithology at the State College of Agriculture? He will be glad to help them estimate the destruction, and will be able to advise what it is best to do in the matter. The children should learn to turn to scientists for information and advice on a question as important as the destruction of wild life.

9. In the study of birds, as in all nature study, avoid having lessons learned from a book. It is far better to have a few facts first-hand from nature than to know what another person has written about a bird. When the initial study has been made by observations in the out-of-doors, the boys and girls may be taught to find answers to their questions in reference books. Every schoolroom should have one good bird book. Perhaps there is no inexpensive publication more useful than Reed's *Bird Guide*.

10. The winter birds will give the best opportunity to prepare for the spring migration. The birds' Christmas tree or a feeding station near

Wild geese migrating

the school will attract many birds, and the children will enjoy watching them. When winter birds appear that you do not know have the boys and girls help you to describe them so that the authorities here at the College can identify them for you. The description should give the following: (a) size, whether larger or smaller than an English sparrow, robin, or crow; (b) general color above and below; (c) specific color markings; (d) kind of bill and feet, if possible; (e) any peculiarity as to note or flight; (f) when and where seen.

11. In the spring as the birds return, the preparation of a bird calendar is interesting and instructive. The calendar may be prepared by the pupils and should show the name of the bird, the date on which it was seen, the place where it was seen, and, if desirable, the name of the person who saw it. If bird calendars are kept accurately and preserved from year to year, they will serve as a valuable record of the migrations for the locality. Most persons are familiar with but few of the commonest birds, and a bird calendar will stimulate observation, which will lead to the identification of the shyer birds that are more rarely seen, and of those that are not resident but pass through in migration. When one stops to consider that over one hundred and fifty different species of birds may be observed in any part of New York State during the course of a year, it is apparent that the average person is familiar with a very small proportion of them. The boys and girls will be interested to increase their knowledge and to add to the bird calendar in order to make it more complete each year. The following migration table will help in the work. It represents the average date of spring arrival of birds at Ithaca, New York, for the past ten years, and will be fairly accurate for almost all parts of the State.

THE AVERAGE DATE OF THE SPRING ARRIVAL OF BIRDS AT ITHACA, NEW YORK

February 1 to 21

Prairie horned lark

February 22 to March 15

Robin
Bluebird
Song sparrow
Canada goose
Red-winged blackbird
Bronzed grackle

March 16 to 25

Meadow lark
Killdeer
Black duck
Bufflehead
Baldpate
Pintail
Mallard
Wood duck
Phœbe
Cowbird
Cedar waxwing
Rusty blackbird
Slate-colored junco
Fox sparrow
Hooded merganser
Mourning dove
Ring-billed gull

March 26 to 31

Golden-crowned kinglet
Purple finch
Sparrow hawk
Savanna sparrow
Vesper sparrow
Cooper's hawk
Sharp-shinned hawk
Marsh hawk
Pied-billed grebe
Belted kingfisher
Great blue heron

April 1 to 5

Coot
Field sparrow
Chipping sparrow
Green-winged teal
Woodcock
Flicker
Yellow-bellied sapsucker
Swamp sparrow
Lesser scaup duck

April 6 to 10

Tree swallow
Blue-winged teal
Pectoral sandpiper
Pipit
Winter wren
Osprey
Bittern

April 11 to 15

Wilson's snipe
Red-breasted merganser
Hermit thrush

April 16 to 20

Goldfinch
Ruby-crowned kinglet
Louisiana water thrush
Barn swallow
Horned grebe
White-throated sparrow
Pine warbler

April 21 to 25

Myrtle warbler
Towhee
Spotted sandpiper
Chimney swift
Virginia rail
Bank swallow
Broad-winged hawk
Green heron

April 26 to 30

Rough-winged swallow
House wren
Brown thrasher
Blue-headed vireo
Black and white warbler
Yellow warbler
Veery

Solitary sandpiper
Black-throated green warbler
Florida gallinule
Bonaparte's gull
Water thrush
Whippoorwill
Sora
Pine siskin

May 1 to 5

Redstart
Least flycatcher
Long-billed marsh wren
Lesser yellowlegs
Bartramian sandpiper
Parula warbler
Catbird
Grasshopper sparrow
Black-crowned night heron
Warbling vireo
Yellow-throated vireo
Nashville warbler
Maryland yellowthroat
Palm warbler
Ovenbird
Black-throated blue warbler
Blackburnian warbler
Baltimore oriole
White-crowned sparrow
Magnolia warbler
Crested flycatcher
Bobolink
Wood thrush
Scarlet tanager
Kingbird
Rose-breasted grosbeak
Red-headed woodpecker
Red-breasted nuthatch

May 6 to 10

Chestnut-sided warbler
Worm-eating warbler
Red-eyed vireo
Olive-backed thrush
Canadian warbler
Least bittern
Greater yellowlegs
Purple martin
Ruby-throated humming bird

May 11 to 15

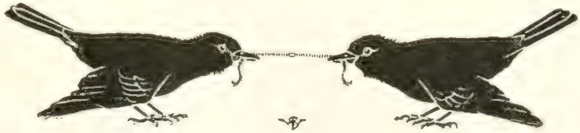
Mourning warbler
Wood pewee
Indigo bunting
Cape May warbler
Hooded warbler
Bay-breasted warbler
Cerulean warbler
Yellow-breasted chat
Philadelphia vireo
Wilson's warbler
Lincoln's sparrow
Tennessee warbler
Orange-crowned warbler
Black-billed cuckoo
Yellow-billed cuckoo
Black tern

May 16 to 20

Orchard oriole
Alder flycatcher
Common tern
Least sandpiper
Red-backed sandpiper
Semipalmated sandpiper
Turnstone
Semipalmated plover
Nighthawk
Blackpoll warbler
Gray-cheeked thrush

May 21 to 30

White-eyed vireo
Yellow-bellied flycatcher
Black-bellied plover
Prothonotary warbler



HOW TO ATTRACT WILD BIRDS

ARTHUR A. ALLEN

HOW would you like to have a wild bird come and feed from your hand? Would you like to stand at your schoolroom window with the children and have a whole flock of wild birds feeding on the window sill? Would you like to feel that you are helping to keep at least a few small birds from starving to death through the long, cold winter? Then follow these directions, and if your efforts do not meet with success at first have a little patience, and a wealth of pleasure is in store for you and your pupils.

When to begin.— Do not wait until the ground is covered with snow before any plans are made to attract the birds; begin now, or at least before the middle of November, and you will succeed in keeping more birds than might otherwise stay.

What food to use.— The winter birds in New York State are of two kinds — seed eaters and insect eaters. The seed eaters that may be expected to come to a feeding shelf are the tree sparrow, the song sparrow, the junco, the redpoll, the pine siskin, the crossbill, and the pine evening grosbeaks. Horned larks and snow buntings prefer to feed in the open, but they can be attracted to spaces in the school yard by scattering seed on the ground. For seed-eating birds good foods to use are cracked corn, buckwheat, hemp, millet, and sunflower seed; or, better still, mixed chicken feed, such as is sold for young chicks, sweepings from a neighboring mill, or hayseed from the barn floor. The insect eaters are the woodpeckers (the downy and the hairy in all parts of the State, with the flicker, the red-headed, and the red-bellied, in the southern counties), the nuthatches, the chickadee, and the brown creeper. The woodpeckers find their natural food by drilling into the chambers of wood-boring larvæ; the others find hibernating insects, pupæ, or eggs in the crevices of the bark. All of them, however, are very fond of beef suet, and once they have found a piece fastened in the tree they will return to it again and again until it is all gone. Sunflower seeds and crumbs of raw peanuts are preferred by chickadees and nuthatches to any other food, but these are not always easily obtainable, and the suet is a good substitute.

Where to place the food.— Do not expect the birds to be tame at first, or to come immediately to the window sill. One of the greatest pleasures to be derived from feeding the birds is to watch the gradual loss of timidity and the increase in confidence of the birds that come regularly to feed. At first they will be as wild as any birds of the woods, but gradually, as

they find themselves safe and unmolested, they will respond to kindness. When a new bird arrives among the regular visitors, he is always noticeably more timid than the others, and sometimes remains shy for several days.

In placing the food it is well to bear in mind that eventually you want all the birds coming to one place, either to a shelf at the window sill or about the flagpole, where it will be easy to watch them. It will be well first to select the place where you wish them to come, whether you immediately build the shelf or not. Then, from this as a center, place the food along radiating lines to a considerable distance from the school. The more pieces of suet put up, the more quickly the birds will find it, and the sooner they will come to the window sill. It is necessary for only one bird to find one piece of suet in order to have eventually a considerable troop coming regularly, for birds are ever on the alert watching their fellows as well as searching for food on their own account. When one bird finds the suet, the others will see him and soon follow. It is better to begin by attracting the chickadees. They respond more quickly, and the other birds seem to follow them about in their search for food, either for the sake of their company, or, more probably, to take advantage of their active habits and keen sight in locating spots where food is abundant.

At first it will be necessary only to tie the pieces of suet to the branches without protection of any kind, and the more conspicuous the places selected, the better. Later, if there are many squirrels, or crows, or house sparrows about, it will be more economical to move the suet to the trunk of the tree, holding it in place by a piece of fine chicken wire (one-half-inch mesh) through which the smaller birds can peck. This precaution will keep squirrels and crows from carrying the suet away in one piece. The house sparrows, moreover, seldom care to cling with their feet to the vertical trunk while feeding, but the native birds find this the most natural and easiest way. Another method is to suspend from the outer branches, by strings, small wire baskets filled with suet. These baskets can easily be made from an ordinary piece of wire by a small boy, as the size and the shape are not important. Wire egg-baskets, soap-shakers, and the like can be used, if one does not care to make his own receptacles. Instead of using wire, some persons prefer to use a bag knitted from string and of such coarse mesh that the birds can easily peck through it. Making these bags would be good handwork for the girls.

The feeding shelf.— As soon as any of the birds have been seen eating the pieces of suet, it is time to put up the feeding shelf. This should be placed at a window on the sheltered side of the school (usually the south),

preferably the one nearest to a tree. If the window sill is very broad, it will be sufficient to nail a cleat along the outer edge to keep the food from blowing off. Usually, however, it is more satisfactory to fasten a board from eight to twelve inches wide to the sill to act as a shelf. It may be made the entire length of the window sill or only a part; but the larger it is, the more birds will feed together, for our native birds all want plenty of elbowroom while they are feeding. A narrow strip should be fastened to the edge of the shelf to keep the food from blowing off. At the westerly end a small evergreen tree or a large branch should be fastened. This offers shelter to the birds and proves as attractive as the food itself. It may be nailed to the window casing, or a hole may be bored in the shelf to hold it. It should be as large as can be conveniently held in place.

Junco at feeding shelf

In case there is not a suitable window sill for the shelf, the suggestion of Mabel Osgood Wright for a flagpole feeding-shelf may prove even more satisfactory.

" Every school has a flagpole, and while some are fastened to the building itself, many stand free and are planted in the yard.

" Around this pole a square or circular shelf about eight inches wide can be fastened, four feet from the ground, and edged with a strip of beading, barrel hoops, or the like. A dozen tenpenny nails should be driven on the outside edge at intervals, like the spokes to a wheel, and the whole neatly painted to match the pole.

" Then, each week one child should be appointed as bird steward, his or her duties being to collect the scraps after the noon dinner hour and place them neatly on the counter, the crusts and crumbs on the shelf and the meat to be hung on the spikes.

" Nothing will come amiss — pine cones, beechnuts, the shells of hard-boiled eggs broken fine, apple cores, half cleaned nuts; and if the children will tell their parents of the counter, they will often put an extra scrap or so in the dinner pail to help the feast. Or the fortunate children whose fathers keep the market, the grocery store, or the mill may be able to obtain enough of the wastage to leave an extra supply on Friday, so that the little pensioners need not go hungry over Sunday.

"All the while the flag will wave gaily above the little Citizen Bird, as under its protection he feeds upon his human brother's bounty."

Once the birds have found the suet in the trees, those pieces farthest from the feeding shelf should not be replenished or should be brought closer and closer until the birds have found the shelf. When the shelf has been found, there is no further need for the suet in the trees, and efforts should be concentrated in keeping a bounteous supply of food always ready on the shelf.

The author has personally had the greatest success in establishing feeding stations by imitating natural conditions as nearly as possible. In the absence of trees about the spot that was most convenient to watch, a large discarded Christmas tree was erected, and about its base was thrown a pile of brush. Close by a log was placed standing on end, to resemble a dead tree for the woodpeckers. A shorter log was capped with the top of a barrel, and protected from the weather by a hood improvised from barrel hoops and a piece of cotton cloth. On the ground was laid a decaying log slightly hollowed to hold seed.

The feeding station described on this page. Chickadee waiting for junco to finish

From time to time the station was supplied with food, and the birds found rich stores. Pieces of suet were fastened to the standing log, or rammed into holes bored in its sides. Bread, cake, doughnut crumbs, small pieces of suet, and mixed chicken feed cracked fine, were kept beneath the hood, and similar food was placed on the ground log. The feeding station was only about twenty-five feet from the back door, yet it proved a veritable paradise for the birds, not only during the winter months when the ground

was covered with snow, but throughout the year. During one spring, for instance, a flock of eleven of the rare evening grosbeaks paid daily visits from the first of April until the middle of May, remaining for nearly a month after the time they usually leave for the North. As I write this (the twenty-first day of May), chickadees, downy and hairy woodpeckers, and catbirds are tasting the suet; while song sparrows, white-throated sparrows, chipping sparrows, and cowbirds are scratching among the seeds. Of course there are house sparrows, many of them; but they do not bother the other birds so long as I provide plenty of food. I feel that I can afford to feed them because their chirping attracts other birds to the feast, and I have many more as a result. As for driving the other birds away, my fears have proved groundless, for next to the chickadee the house sparrow has shown himself the biggest coward of the lot, and I have frequently seen a whole flock put to rout by a single nuthatch.

Whatever type of feeding station is decided on, two things should always be borne in mind: first, once the birds have come to depend on the food supplied, it should not be discontinued for even a few days during the winter when other food is scarce, for they might starve as a result; second, the birds need shelter as well as food, shelter from the weather and from their natural enemies. The Christmas tree at one end of the shelf does very well to shelter the birds while they are feeding; but if there are no thick trees nor brush piles in the near vicinity into which they can disappear at the approach of a hawk, some such shelter should be created from five to thirty feet from the feeding station. This can be done by erecting a tepee of poles and evergreen boughs, or by bringing in a pile of brush. Moreover, this will prove a great incentive to the birds to come to the window, as they will hesitate to fly long distances through the open even in order to get to food. If there are no trees at all in the vicinity of the school, it may be necessary to establish a series of these shelters every fifty feet to the nearest trees. If properly arranged with evergreen boughs there is no need of their being unsightly. An admirable birds' tepee can be made of the poles used for lima beans with the vines attached. This is also a good way of storing the poles over winter. The need of these shelters will be emphasized if there are hawks about. Only yesterday a sharp-shinned hawk swooped down at the birds feeding at my station and made an attempt to catch them. He was unsuccessful only because of the brush pile into which they all darted at his approach.

As many chickadees, nuthatches, and woodpeckers as I have ever seen at a feeding station were assembled at one maintained on a balcony. There was but one tree within five hundred feet, and the only shelter

afforded was the evergreen boughs and the dead stub of a tree brought in and erected at one corner of the balcony. Do not think, therefore, that your school is too unfavorably located to attract the birds. If you have never tried it, you little know what pleasure is in store for you.

THE CHICKADEE

(For special study)

Anna Botsford Comstock

Of all the birds that stay with us to make cheerful our northern winter, the chickadee is easily the favorite. No matter how cold or gloomy the day, its cheerful song and delightful personality charm the passer-by. The chickadee in winter seems friendly, and it is friendly. It devotes its entire energies all winter to hunting and eating insect eggs or the insects tucked away in their winter quarters ready to attack the leaves as soon as they push out from their buds in the spring. It is particularly fond of the cankerworm's eggs; and an experiment made by the Massachusetts State Board of Agriculture demonstrated that orchards to which chickadees were enticed during the winter were almost entirely free from this insect pest, while neighboring orchards were destroyed by it.

As a winter visitant, the chickadee usually appears in company with the nuthatch; and the downy woodpecker is frequently a follower of this cheerful band. The nuthatches work on the trunks and larger limbs of the trees, while the chickadees work industriously on the twigs and buds. It is interesting to see a chickadee carefully examine a twig for insect eggs. He looks it over carefully from above; then, swinging over, head downward, inspects it from below.

The chickadee is gray above; the top of the head, the nape, and the throat are black; the rest of the under parts and the sides of the head are grayish white. The chickadee can be easily distinguished from the nuthatch by its black bib; the nuthatch has a black cap, but it is white at the throat. The chickadee's beak is short and pointed, making a sharp little pick exactly fitted for getting the insect eggs and cocoons hidden away among the leaf buds. The woodpecker's beak is a long, strong chisel, fitted for cutting a passage to the burrow of the borer in the tree or to the beetle under the bark.

One of the most charming things about the chickadee is its song. Its cheerful *chick-a-dee-dee* has an inspiring quality, which brings courage and cheer to the heart of the listener. In February, and as the spring advances, the chickadee sings *phœbe* more distinctly than does the phœbe bird and far more musically. The songs of the two birds may be distinguished readily. In the *phœbe* note of the chickadee, the

last syllable is at least one note lower than the first, is long drawn out, and has a falling inflection; while the last syllable of the phœbe bird's song is short and has a rising inflection. The chickadee has also a cheerful little yodel, which it sings when it is very happy.

The chickadee builds its nest in a decaying stump or a post, oftenest in a birch stump, in a hole that the pair of birds excavate, working together industriously. Sometimes a hole already made is used. The bottom is lined with fine grass, feathers, hair, or moss. The eggs, from five to eight in number, are white, speckled sparingly with reddish brown. The nest is made in May.

The chickadees and the nuthatches may be induced to visit our orchards and shade trees if we put out strips of beef fat about once a month during the winter. These strips should be tied to the branches. The birds seem to regard this as a sign of friendship on our part, and will remain for hours doing their best to rid the trees near-by of hidden enemies. If the suet is placed on branches that may be seen from the windows of the schoolroom, the pupils may be able to observe these interesting and useful birds every day and become familiar with their habits and their economic value.

A friendly chickadee

SUGGESTIONS FOR STUDY

Why does the chickadee remain in the North during the winter? Why do the robin and the bluebird go South?

Where do you see the chickadees in winter? What are they doing?

What other birds are associated with the chickadees in winter? What is there in the colors and the markings of the chickadee by which you can tell it instantly from the nuthatch and the downy woodpecker?

Describe the colors of the chickadee as follows: top of head, back, wings, tail, throat, and breast.

Compare the beak of the chickadee with that of the downy woodpecker, and tell why each is best adapted to procure food for its owner.

Does the chickadee find its food on the trunks of trees or on the twigs? What is the food that it finds in the North during the winter?

Describe the chickadee's actions when hunting for food.

Why is the chickadee of great value to the farmer and the fruit grower?

How can these birds be induced to visit orchards?

What is the chickadee's song? Did you ever hear it sing *phœbe*? At what time of year?

Where do the chickadees build their nest? Of what material is it made? When is the nest built?

What colors and marking are on the eggs?

BIRDS TO BE RECOGNIZED IN 1915-1916

ARTHUR A. ALLEN

TWO WINTER BIRDS[2]

KINGLET

Size.— Much smaller than the English sparrow.

General color.— Olive-green above, whitish below.

Distinctive features.— The male golden-crowned kinglet has an orange and yellow patch bordered with black on top of the head; the female lacks the orange. The male ruby-crowned kinglet has a partly concealed red patch on top of the head, which can be seen plainly when he sings; the female is without the patch. Both have two white wing bars. These points and the small size, will serve to distinguish the kinglets.

Ruby-crowned kinglet

The smallest of all the winter birds are the kinglets. They are but four inches long, and the only birds that are smaller, are the humming birds. With their thick coats of warm feathers, the golden-crowned kinglets brave even the severest winters, although they always prefer the shelter afforded by the evergreens, and are seldom found far from them. They hop about on the smallest twigs, or even hover before the very tips, much as do humming birds before flowers.

[2] Among the other birds to be recognized the brown creeper, the crow, and certain of the hawks are also winter birds.

Another species, the ruby-crowned kinglet, is found in New York State only during its migrations in spring and fall. Both species have the power of raising and lowering the crest feathers so that at times the bright color patch appears much more brilliant than at others.

The ruby-crowned kinglet has a beautifully executed warble, which is very sweet and surprisingly loud for the size of the bird; but the song of the golden-crowned is rather insignificant, and so high-pitched that some persons cannot hear it.

Most of the kinglets go farther north than New York State to nest, but a few of the golden-crowned remain on the tops of the higher Adirondacks and Catskills. The nest is made of bark, moss, and feathers, and is suspended in the thicker parts of the branches of evergreen trees from six to sixty feet from the ground. The nine or ten eggs are whitish marked with brown.

BLUE JAY

Size.— Larger than a robin.

General color. Blue above barred with black, gray below, white spots on the tail and the wings.

Distinctive features.— Large size and blue color will distinguish it from all but the kingfisher. Both the blue jay and the kingfisher have crested heads and a dark band across the breast, but the blue jay has a much longer tail tipped with white, and a shorter and more slender bill.

Jays are noisy, quarrelsome birds the world over, and blue jays are no exception to the general rule. When a flock of them get together in the fall or the winter, they make the woods ring with their resonant notes, and woe betide the poor owl should he be discovered. The loud *jay-jay* note of one of the flock announces the discovery, and in a moment every bird in the woods has assembled and has begun to torment the sleepy owl. They are wary birds, however, and should you try to approach and learn the cause of the uproar, they will suddenly become quiet and slink away so that not even one of them may be seen. At other times, however, they show no fear of people, and they may venture close to the house, take food from a window feeding-shelf, or even nest in oak trees or cedars near-by.

Blue jays are somewhat unevenly distributed in New York State, being rather common in the eastern and western parts but rare in many of the central counties. They seem to prefer evergreen or mixed woods for their abode, but feed largely on acorns, chestnuts, and beechnuts.

The nest of the blue jay is composed of sticks, leaves, and bark, and is lined with rootlets or other finer materials. It is somewhat larger than the nest of a robin. It is often placed in an evergreen tree, but sometimes in small deciduous trees from ten to twenty feet above the ground.

From three to six pale olive-green eggs, spotted with brown, are laid during the last of April or the first of May.

During the nesting season blue jays incur the enmity of all the other

Blue jay

birds and of mankind as well by their habit of robbing the nests of smaller birds and eating the eggs or the young. At other times, however, they do considerable good by destroying injurious insects.

Bluebird

BLUEBIRD

Size.— Larger than an English sparrow, smaller than a robin.

General color.— Above blue; throat and breast brownish red; belly white.

Distinctive features.— The shape is distinctive, for the bird appears as though somewhat round-shouldered. The male has a habit of fluttering one wing when alighting. These features together with the general color will distinguish the bluebird.

The first robin has been seen in the orchard, scolding at the drifts that cling so long to the fence rows. An early peeper chirps from the pond by the roadside, and the whole landscape steams beneath the bright March sun. A gentle breeze brings us news from the southland and gives us the first fresh odor of spring. Then out of the clear heavens comes the call of the bluebird, gentle and soft and full of gladness, breathing of life and happiness and joy to come. What a wealth of feeling comes with those first mellow notes, what friendliness, what good fellowship toward all nature. The robin scolds at the surly snowdrifts, he sulks whenever the weather turns cold; but not so the bluebird. The March winds with their snows and ice hold no terrors for him, his merry call is never without optimism.

The bluebird sometimes arrives in Ithaca as early as the last week of February, but usually it is the first week of March that brings him. We always begin to listen for him on the day following the first robin, and many, many times he has come just as we have expected him. Occasionally the robin gets here a week or more before the bluebird. That is usually a sign of more cold weather, for the bluebird is a better weather prophet than the robin, and is not so often overtaken by the late snows. Then come the song sparrow, the wild goose, the red-winged and the crow blackbird; and it is the middle of March.

Now is the time to have the nesting box ready to coax the bluebird from orchard or roadside to a more intimate place beneath the window or on a post in the yard. The bluebird delights in a nesting box, almost preferring it to a hollow limb in the orchard; and now that the modern orchard has so few dead limbs and knot holes, we should feel it our duty to build the nesting boxes. Almost any

sort of box may be selected by a pair of bluebirds for their home, but the one that looks most like the old hollow limb in the orchard will prove most attractive. The entrance hole should be made on one side near the top, and should be about an inch and a half in diameter. No nesting material should be placed in the box, unless perhaps a little sawdust in order to make it seem more like a real cavity. When the bluebirds have once found the box, they may return to it year after year.

The bluebird builds a well-formed nest of rootlets and grasses, and from three to five pale blue eggs are laid in it. Both birds take turns sitting on the eggs, which hatch in less than two weeks. The young remain in the nest about two weeks longer; and for some time after they have left the nest, they are fed in the trees by their parents. Before they are able to shift for themselves, however, the parent birds begin a second nest. Occasionally they pull out the first nest and build the second in the same box, but oftener they move to another site; so that it is always well to provide more than one box.

The young bluebirds when they leave the nest do not resemble either of their parents, for their backs are marked with whitish and their breasts have dark spots. In the latter respect they show their relationship to the true thrushes, all of which in some plumage have spotted breasts.

In the late summer and fall the bluebirds gather in scattered flocks, often associating with chipping sparrows, and are found all through the open farming country. Their call at this season, *tur-ree, tur-ree,* while quite as friendly as the note of spring, has just a tinge of sadness, and seems as much a part of the fall months as are the calls of the katydids or the rustle of the dead leaves.

CHIPPING SPARROW

Size.— Smaller than an English sparrow.

General color.— Above dark brown, streaked; below grayish white without streaks or spots.

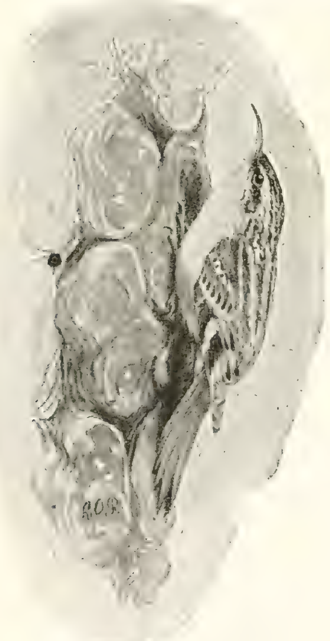
Distinctive features.— The reddish cap, a black line from the bill through the eye, and the unstreaked breast will distinguish it.

Chipping sparrow

With the exception of the robin, perhaps no one of our native birds is more sociably inclined than the chipping sparrow. Hopping about

our lawns and gardens, he soon becomes accustomed to persons passing and often becomes so tame that one can approach within two or three feet without frightening him. In fact, it is not a difficult task to tame chipping sparrows so that they will feed from one's hand, and they very readily respond to a little kindness, and come regularly to be fed if seeds or bread crumbs are habitually scattered in the same place.

The chipping sparrow arrives in central New York in the first week of April, and leaves at the end of October, spending the winter months in scattered flocks in the Southern States. When the birds first arrive in the spring, they are less friendly than later, and spend their time in the tree tops. As soon as the grass becomes green, however, and the dandelions are in seed, they drop to the lawns where they find a bountiful repast on the newly formed seeds.



Brown creeper

The first nests of the chipping sparrows are commenced about the beginning of May, and are often placed very near the house, in the vines on the porch, in the lilac bushes, or near the tip of a low branch on the apple or the evergreen tree. The nest is a beautiful little structure composed largely of horsehair, with a few grasses or rootlets on the outside. For this reason the chippy is sometimes called "hair bird." The eggs, numbering four or five, are a delicate blue or greenish blue, with a circlet of brown or black markings about the larger end.

The chipping sparrow is one of the birds very frequently imposed on by the parasitic cowbird.

BROWN CREEPER

Size.— Smaller than an English sparrow.

General color.— Above streaked cinnamon brown; below grayish white.

Distinctive features.— This is the only small brown bird that will be seen climbing up the trunk of a tree using its tail as a prop.

The brown creeper is a slender, brownish, streaked bird that seems to spend its entire life searching for insects in the bark of trees. It has a rather long tail of stiff feathers, which, like that of a woodpecker, helps

support it; the bill is long and curved for prying into the crevices of the bark. It seldom seems to rest or even to break the monotony of its search for insects by singing. The creeper's only note while with us during the fall, the winter, and the spring, is a high-pitched sibilant whistle, which is delivered without pausing. In searching for food the brown creeper starts at the base of a tree and winds a spiral course to the top, only to swoop quickly to the base of the next tree, and repeat its performance. As Dr. Mearns has written, " The creeper has many ups and downs in its life though, on the whole, it is a monotonous career of labor."

The creeper has but little fear of man, and ventures even to the center of large cities. Often, if one remains quiet, it will fly to the base of a tree only a few feet away, and creep up perfectly unconcerned, but at the least movement it is quick to hitch around to the opposite side of the tree.

Most of the brown creepers go farther north than New York State to nest, but some remain in the Adirondacks, the Catskills, and the cooler swamps in other parts of the State. The nest, which is made of fine twigs, bark, and moss, is usually placed beneath loosened pieces of bark, from two to twenty feet from the ground. The eggs number from five to eight, and are white marked with brown and lavender chiefly about the larger end.

BARN SWALLOW

Size.— About the size of an English sparrow, but much more slender.

General color.— Above steel blue; below brownish orange.

Distinctive features.— The long pointed wings, the deeply forked tail, and the orange under parts will distinguish it.

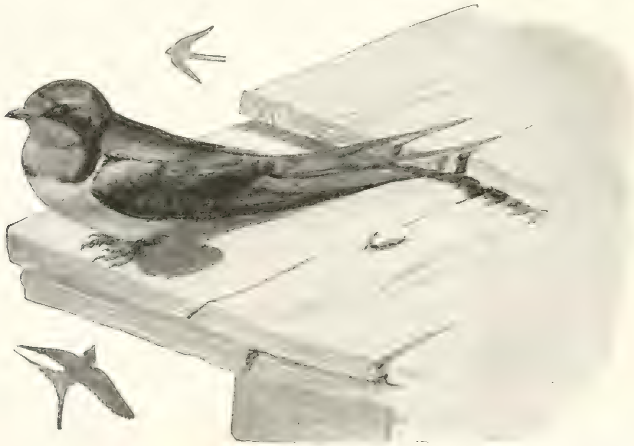
There are six different kinds of swallows found in New York State, of which the barn swallow is probably the most common and best known. They all have long, pointed wings and peculiar flat heads with small bills, but the barn swallow is the only one that has the deeply forked tail. Two of the six swallows are brown above, and the other four are dark steel blue.

Of the brown swallows, the bank, or sand, swallow can easily be distinguished from the rough-winged swallow by the conspicuous dark band across its breast, contrasting with the white throat and under parts. The entire throat of the rough-winged swallow is dark and the rest of the under parts grayish white.

Of the blue-backed swallows, the purple martin is much larger than any of the rest, and the under parts, as well as the back, are dark steel blue. The female, however, is grayer. The tree swallow looks considerably like the barn swallow, but has the under parts snowy white instead of dull orange, and does not have the deeply forked tail. The

cliff, or eave, swallow likewise has a square tail, and while its under parts are very much like those of the barn swallow, it can easily be distinguished from it by a buffy patch on the rump.

The bank and the rough-winged swallows nest in holes in sand banks or in cliffs, but all the others may nest about the house. The purple martins and the tree swallows will nest in bird boxes placed on exposed poles, and the barn and the cliff swallows build their nests of mud about the barn. The barn swallow's nest is cuplike with the opening at the top, and is usually placed inside of the barn near the gable. The cliff, or eave, swallow, on the other hand, usually builds on the outside beneath the eaves. Its nest is gourd-shaped with the opening at the side. Both



Barn swallow

species line their nests with feathers, and lay four or five white eggs spotted with brown.

The barn swallow spends the winter in South and Central America, but returns to central New York somewhat after the middle of April, and begins to nest about a month later. For nesting purposes, it prefers the old-fashioned barn, whose doors always stand hospitably open, but it can be enticed to the more modern structures if the ventilation holes beneath the gable are made sufficiently large, and the beams within are not too smooth to hold the nests.

Swallows are valuable birds to have about the farm because they live entirely on insects, and destroy great quantities of mosquitoes, moths, flies, and other pests. There are cases on record of farms that have been well protected by swallows from insect foes, while adjacent farms that had no swallows, were entirely denuded.

As early as July the swallows begin assembling in large flocks in preparation for their fall migration, and during August and early September

we often see the telegraph wires, especially near marshes or bodies of water where there is plenty of insect food, so covered with swallows that it seems impossible for another one to crowd in. When something alarms them, the air is suddenly filled with thousands of graceful forms darting, diving, and circling in a perfect maze of intricate figures.

WOOD PEWEE

Size.— About the size of an English sparrow.

General color.— Dark gray above; grayish white below.

Distinctive features.— Its erect posture will place it among the fly-catchers. Its grayish upper parts with the bill pale beneath will distinguish it from the phœbe, but its most distinctive characteristic is its high-pitched whistle, Pee · o · wee.

If the pewee were a silent bird few persons would ever know that he existed, so inconspicuous is he in his brownish gray plumage high up in the trees. As it is, most persons know him by his sweet, gentle call, but seldom see him. The pewee does not flit about among the leaves as do the more active warblers and vireos, but sits quietly on some dead branch from which he can survey all sides, until some passing insect attracts his attention, when he darts out after it only to return again and resume his quiet, restful pose.

Wood pewee

The nest of the pewee is even more inconspicuous than the bird, and is as perfect a structure of its kind as one can imagine. Saddled on a horizontal branch, often a dead one, it is neatly woven of grasses and rootlets in a compact and symmetrical form, with no waste of material. The outside is so thickly covered with lichens that the whole nest appears like a knot or an excrescence on the bark. The three or four eggs are creamy or pinkish white with a wreath of chocolate and lavender spots about the larger end.

ORIOLE

Size.— Larger than an English sparrow, smaller than a robin.

General color.— The male Baltimore oriole is brilliant orange and black; the female is dull orange and brownish black. The male orchard oriole is deep chestnut and black; the female is dull greenish yellow.

Orchard oriole

There are two species of orioles in New York State, the Baltimore and the orchard; the latter, however, is not common except in the lower Hudson Valley, and, in most localities, is extremely rare and is seldom seen. The probability is that, except in the vicinity of New York City, any oriole that is seen will be the Baltimore oriole.

The male Baltimore oriole, next to the scarlet tanager, is our most brilliantly colored bird, and certainly one of the most conspicuous, for he makes no attempt to hide his charms, and his loud, clear whistle of several notes rings out as one of the most pleasing sounds from our orchards and shade trees. The song of the orchard oriole is a much more varied and finished performance than that of the Baltimore, and at times is suggestive of that of the bobolink and of the purple finch.

Baltimore oriole

After the leaves have fallen in autumn, the nests of the Baltimore orioles are very striking as they swing from the outermost branches of our shade trees, particularly the elms and the maples. In some trees may be seen fragments of three or four nests, for very often the oriole returns to the same tree year after year, and the nests are tightly woven and so firmly fastened as to withstand the storms of many years. Baltimore orioles usually build their nests of strong plant fibers of a grayish color, but they are quick to take advantage of strings and yarn that are put out for them, and to weave

them into the nest. The orchard orioles, on the other hand, always build their nests of wiry grasses of a straw color, and they never hang them on the outer branches but prefer the tops of scrubby fruit trees.

The eggs of both species are white or bluish white, spotted and scratched with black, those of the orchard oriole having more of the spots and those of the Baltimore having more of the scratches.

HAWK

Thirteen species of hawks are found more or less regularly in New York State; but three of these — the goshawk, the pigeon hawk, and the duck hawk are too rare to be of great importance. All the hawks vary so much in size and in coloration with both age and sex that it is difficult to describe any species in a few words, but four types are recognized in addition to the bald eagle and the osprey, or fish hawk.

HARRIERS

The first of these types, the harriers, includes only the marsh hawk, a long-winged, long-tailed hawk with a conspicuous white patch above its tail. It is like the owls in having a facial disk of short feathers, and very well-developed ears. The ears undoubtedly assist the bird in following its prey, consisting largely of mice, through the long grass of the fields and marshes, which it inhabits. In addition to mice, the marsh hawk feeds on snakes, frogs, insects, and small birds. Occasionally it takes young chickens or small ducks; but of 124 stomachs examined by Dr. Fisher, of the Biological Survey at Washington, D.C., only 7 showed any sign of having taken poultry. This is, therefore, a highly beneficial species, deserving of protection.

BROAD-WINGED OR FAN-TAILED HAWKS

The second type includes the red-shouldered, the red-tailed, the rough-legged, and the broad-winged species. They are alike in possessing broad, rounded wings, and broad, comparatively short tails, which they usually spread in a fanlike manner while soaring. They are the most conspicuous of all the hawks, being often seen soaring in great circles overhead. Because of their conspicuousness they have had to suffer for all the crimes of their more crafty relatives, and are frequently known as hen hawks or chicken hawks. As a matter of fact they seldom, if ever, visit the poultry yard, and the few times that they do are more than offset by the numbers of obnoxious rodents that they destroy. Of 105 stomachs of the rough-legged and the broad-winged species examined, not one contained poultry; of 782 of the red-tailed and the red-shouldered hawks, only 57 contained poultry or game birds.

FALCONS

The third type has rather heavy shoulders, short, pointed wings, and narrow tail. In this type are included the duck hawk, the pigeon hawk, and the sparrow hawk, but the last named is the only one of sufficiently generally occurrence to have great importance in the State. It is common in most parts of the State about the borders of woods and pastures, usually nesting in a deserted flicker's hole high up in a dead stub. The duck hawk and the pigeon hawk, when they do occur, frequently destroy many pigeons, but the sparrow hawk feeds mostly on the larger insects, meadow mice, and the smaller birds. Of 320 stomachs examined by the Department of Agriculture, not one contained poultry, 215 contained insects, 89 contained mice, and 53 contained small birds.

Immature red-shouldered hawk, a beneficial species

SHORT-WINGED HAWKS, OR ACCIPITERS

The fourth group contains the real poultry thieves. These birds have short, rounded wings and long, narrow tails. Three species are found in the State, but the largest, the goshawk, is rare. Of the other two species, the Cooper's hawk is the larger, the females sometimes measuring nearly twenty inches in length, although the males are barely sixteen inches long. The largest (female) sharp-shinned hawks never measure over fourteen inches, and the males measure less than twelve. Both species are much alike in coloration, immature birds being brown above and white below with longitudinal streaks of dark brown. Old birds are slaty gray above and white below, heavily barred with brown. In addition to its larger size, the Cooper's hawk differs from the sharp-shinned in having a rounded tail, that of the sharp-shinned being square.

Both birds frequent woodlands rather than open country, and are seldom seen soaring high in the air. They dart through the thickets or skim low over the ground in search of their prey, or come to rest on a low branch of a tree. The sharp-shinned hawk, because of its small size, attacks mostly the smaller chickens, but the Cooper's hawk is able to carry off nearly full-grown fowls. Because of their elusive ways, a poultry owner may often hear commotion in the poultry yard and miss many a fine fowl before he gets even a glimpse of the culprit; and many an innocent, but more conspicuous, hawk of the broad-winged species has come to an ignominious end by the gun of a well-meaning but uninformed hunter or poultryman.

PHOTOGRAPHED BY G. A. BAILEY

The sparrow hawk with house sparrow

About their nesting grounds both species are noisy, scolding from a safe distance at any intruder. The sharp-shinned hawk always nests in a thick evergreen; the Cooper's hawk nests indiscriminately in pines or hardwoods, usually within fifteen or twenty feet of the ground but occasionally in the tree tops. Both birds sometimes remodel the nests of crows or squirrels, and generally use a few green leaves or evergreen twigs for lining. The Cooper's hawk begins to nest the last of April, but the sharp-shinned hawk usually waits until the first of June. The eggs of the former are nearly pure white; those of the latter are very heavily spotted with brown. As with other hawks, the period of incubation is long, and the young develop slowly, so that it is between two or three months from the time the eggs are laid until the young leave the nest. The young are at first covered with white down, and resemble small chickens. They are unsuspicious and lack the fierce natures of their parents until their feathers begin to grow. Taken while very young they can be tamed, some having been used as are the true falcons in hunting small game.

CROW

In New York State the crow came in with civilization. Although practically unknown while the country was covered with dense woods, he has now become one of our most abundant and best-known birds. Sociable in his nature, omnivorous in his feeding habits, sagacious in his actions, he is eminently fitted to replace the solitary raven, which left us with the forests. In no place is he more at home than in the farming districts. Here he finds open country in which to feed, as well as timber sufficient to shelter his nest. He usually escapes his few enemies. It is seldom that he falls a victim to a hungry hawk or a starving owl, and he avoids even more successfully the man with a gun.

The crow is generally considered a thief and a scoundrel, and his better side is overlooked entirely. He robs the nests of smaller birds, devours a great deal of grain, and, in his zeal for hunting cutworms and grubs, uproots enough young corn to blacken his name with any farmer. Seldom is his aid in destroying insect pests and vermin appreciated, although these, if allowed to go unchecked, would do much more damage than the crow himself.

The chief fault of a crow lies in the fact that he is lazy. An omnivorous feeder, he takes whatever comes most easily — locusts, cutworms, white grubs, mice, frogs, fish, young birds, or grain. Whatever is most abundant and most easily obtained forms his diet. In this way he becomes of great assistance in checking the larger of our insect foes, for any excessive increase in their numbers means to him simply "easy food," and he feeds entirely on them until their numbers are reduced, and something else is more easily obtained. It is only when other food is scarce that he does much damage to grain or young birds. Therefore, if we can protect our grain without destroying the crow, we shall be doing a service both to mankind and to nature.

The crow usually nests in a crotch of a large tree, seldom out on a limb. The nest is composed of large sticks lined with finer twigs, grapevine bark, and the like. The material is carried in the bill, never by the feet. The eggs are light green, spotted with dark green, brown, or black, and are about the size of a small hen's egg. Young crows stay in the nest for about three weeks. They can fly fairly well, if not frightened from the nest too soon. Experiments in feeding have shown that a young crow requires food equal to one-half his own weight each day, and would eat more if he could get it.

In order to prevent crows from eating the corn, the seed is sometimes coated with coal tar or creosote. This is done by dipping a wooden paddle into the hot liquid and stirring it among the kernels. This process does not destroy the germinating quality of the corn.

FLICKER

Size.— A little larger than a robin.

General color.— Dark brown above; light brown below, marked with round black dots. Quill feathers of tail and wings black above; golden yellow below.

Distinctive features.— A scarlet crescent across nape of neck; white spot to be seen on the rump when flying. The flicker is our only brownish woodpecker.


Flicker, or golden-winged woodpecker

The flicker is a noisy bird. From the time it arrives during the latter part of March or first part of April, until it leaves again in the fall, we can hear its strident notes at all times of the day. In addition to quite a variety of calls like those of other woodpeckers, the male also indulges in a rolling tattoo in the spring, and seems to delight in a hollow drain-pipe or other resonant surface that will cause his drumming to be heard for half a mile and to wake up every one in the neighborhood. Another curious habit of the flicker is that whenever two of them get together they perform an elaborate ceremony of bowing, bobbing, and strutting, during which the tail is stiffly spread, and various comical attitudes are assumed. It is at such times that they utter the call that gives them their name, *flicker-flicker-flicker*, or *wick-awick-awick*.

Although the flicker is a woodpecker, it frequently departs from the

habits of its relatives and descends to the ground to feed on ants. Like all other woodpeckers, however, it excavates a hole in a tree in which to rear its young. The opening is usually about two and a quarter inches in diameter, and the hole is from two to twenty-four inches deep, the bottom of the hole being enlarged into a chamber on the floor of which are laid the five to nine glossy white eggs.

Other common names for the flicker are high-hole, yellow-hammer, and golden-winged woodpecker.

MARYLAND YELLOWTHROAT

Maryland yellowthroat

Size.—Smaller than an English sparrow.

General color.—Olive-green above; yellow below.

Distinctive features.—The black robber's mask, bordered by gray, and the yellow under parts, brighter on the throat, will identify this bird.

The Maryland yellowthroat lives in the tangles of sedges and thickets that fringe marshes or moist, low-lying ground. It would be impossible to find the bird if it had a mind to hide, but the yellowthroat has such a curious disposition that one cannot remain long in its haunts before it gives an impatient *chack* and hops onto some log or other exposed perch to obtain a better view. Then again it will run along the ground, threading its way among the weeds. Its skulking habits and the peculiar black mask of the male might lead one to suppose him a pygmy highwayman, lying in wait for some unsuspecting passer-by. And, perhaps, he is the most bloodthirsty of them all if we think of the traveler as being a fat beetle or a juicy caterpillar.

If one remains in the yellowthroat's haunts for any length of time, he is sure to hear it sing, *witchity, witchity, witchity, witchity*, or perhaps we might express it, *wichery, wichery, wichery*, as more suggestive of those mysteries that enshroud the marshes.

The yellowthroat builds a rather bulky nest of dead leaves and coarse grasses, lined with finer materials, and places it on the ground in a tussock of grass among the weeds, or in a thick bush near the ground. From three to five white eggs, rather thinly speckled with brown, are laid.

The female yellowthroat does not have the robber's mask of the male, and is rather inconspicuous.

BIRD QUOTATIONS

CHICKADEE

When piped a tiny voice hard by,
Gay and polite, a cheerful cry.
Chic-chicadeedee! saucy note
Out of sound and merry throat,
As if it said, "*Good day, good sir!*
Fine afternoon, old passenger!
Happy to meet you in these places,
Where January brings few faces."

From *The Titmouse*
by RALPH WALDO EMERSON

BLUE JAY

Clad in blue with snow-white trimmings,
Clean and smooth in every feather,
Plumed and crested like a dandy,
Keen of vision, strong of muscle,
Shrewd in mimicry and dodging,
Knowing every copse and thicket,
Warm in snow and cool in summer,
Is the blue jay still a villain?
Outlawed by all bird tribunals,
As a wretch disguised, he's branded,
Shunned by every feathered creature;
Yet he prospers, man admires him.

From *Chocorua's Tenants*
by FRANK BOLLES

KINGLET

The plaintive calls of bluebirds fill the air,
Wand'ring voices in the morn;
The ruby kinglet, flitting here and there,
Winds again his elfin horn.

From *In October*
by JOHN BURROUGHS

BLUEBIRD

The world rolls round — mistrust it not,
Befalls again what once befell;
All things return, both sphere and mote,
And I shall hear my bluebird's note,
And dream the dream of Auburn dell.

From *May Day*
by RALPH WALDO EMERSON

BARN SWALLOW

At play in April skies that spread
Their azure depths above my head
As onward to the woods I sped,
I heard the swallows twitter;
O skater in the fields of air
On steely wings that sweep and dare,
To gain these scenes thy only care,
Nor fear the winds are bitter.

From *The Swallow*
by JOHN BURROUGHS

WOOD PEWEE

Only a little forest brook
The farthest hem of silence shook:
When in the hollow shades I heard,—
Was it a spirit, or a bird?
Or, strayed from Eden, desolate,
Some Peri calling to her mate,
Whom nevermore her mate would cheer?
"*Pe-ri! pe-ri! peer!*"

From *The Pewee*
by JOHN T. TROWBRIDGE

ORIOLE

How falls it, oriole, thou hast come to fly
In tropic splendor through our Northern sky?
At some glad moment was it nature's choice
To dower a scrap of sunset with a voice?

From *To an Oriole*
by EDGAR FAWCETT

HAWK

On outspread wings a hawk, far poised on high,
Quick swooping screams, and then is heard no more:
The strident shrilling of a locust nigh
Breaks forth, and dies in silence as before.

From *Summer Drought*
by J. P. IRVINE

CROW

My friend and neighbor through the year,
Self-appointed overseer

Of my crops of fruit and grain
Of my woods and furrowed plain,

Claim thy tithings right and left,
I shall never call it theft.

From *The Crow*
by JOHN BURROUGHS

FLICKER

Ah! golden shaft, 'twas he that laughed
And lifted up his bill;
Wick, wick; wick, wick; wake up, be quick;
The ant is on her hill.

From *Arbutus Days*
by JOHN BURROUGHS

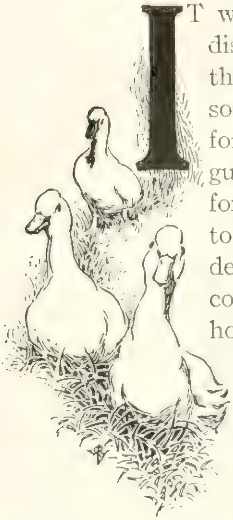
MARYLAND YELLOWTHROAT

A living sunbeam, tipped with wings;
A spark of light that shines and sings
Witchery — witchery — witchery.

From *The Maryland Yellowthroat*
by HENRY VAN DYKE

POULTRY NOTES

THE EDITORS



IT would be an excellent arrangement if in every rural district there were a well-developed poultry farm that the teacher might find available for some school lessons and experiences. It would be all the more useful for educational work if turkeys, ducks, geese, and guinea fowls were included among the domestic fowls, for there is much intellectual and practical benefit to be gained from studying the history, the modern development, and the possibility of adding to the income by using modern methods of raising poultry for home use and for market. If there is no such poultry farm in the neighborhood, the teacher will doubtless be able to find some one who is a successful poultry raiser, and may be able to secure his cooperation in interesting the children in better and more economical poultry raising.

All through the fall and winter days there will be occasions for discussing poultry. Many teachers now have the children bring a hen, chickens, or other kinds of poultry, to school to be studied there, and this adds interest. Young folk are specially interested in this work about Thanksgiving time, and their efforts might be aroused in making a survey of the poultry in the community. The teacher could direct the survey along the following lines:

1. Who owns the largest flock of poultry in the district?

2. How many kinds of poultry are included in it? How many breeds and varieties are represented? Why are these breeds and varieties selected?

3. How are the birds housed? How fed?

4. Make a list of all the breeds and varieties of poultry to be found in the district, and learn the distinctive characters of each (page 1144).

5. How many farmers in the district raise poultry for market? How are the products marketed?

Perhaps it will be possible, in some communities, to raise a brood of chickens at the school. This has already been done, and has afforded some very interesting and profitable work for the boys and girls. Many of the lessons in this leaflet could be taught in a concrete way that would add value to the instruction.

Any rural teacher who contemplates having a brood of chickens at the school next spring, will find the following plan suggestive:

1. Read over carefully lesson VII on page 1155 and discuss it with the pupils.

2. Take a survey of the school premises, and decide which is the most suitable place for keeping the hen. It should be quiet, dark, well-ventilated, and cool. A box placed in the woodshed might serve (illustration on page 1156). The preparations for raising the chickens might give opportunity to have the woodshed thoroughly cleaned, which would be a helpful exercise for the boys and girls.

3. About April 1 the nest can be prepared. Instructions for this will be found on page 1156.

A flock of poultry raised at the schoolhouse

4. Have the children watch the home flock for good, broody hens, and discuss in school the relative merits of those available, covering such points as breed, age, health, disposition, length of time that the hen has been broody, and the like. The more familiar the children become with available hens, the more observing they will be of poultry in future. If the discussion is wisely guided, opinion will center on the best hen for the purpose.

5. The next step will be to secure the eggs. Perhaps some successful poultry man who has pure-bred stock, will contribute the eggs for this school work. If the donor will come to the school with a basket of eggs, and teach the children to select from it the most suitable eggs for a setting, following the lesson on page 1154, it will add to the interest. In many

communities teachers will be able to find young farmers who have had instruction in poultry husbandry at an agricultural school or college, who will be glad to make a contribution of information, eggs, or stock to the school.

6. After the hen has been brought to school place her on the nest with two or three eggs not taken from the setting. Care for her, and, in two or three days, she will show whether she is going to sit; then the selected eggs can be placed under her. Follow the directions given on page 1156 for the care of a sitting hen.

7. Instructions for placing the eggs under the hen, caring for the hen during incubation, and the care of the hen and chickens at hatching time, will be found on pages 1155 and 1156.

8. Directions for raising the chickens will be found on pages 1159, 1160, and 1162. The boys and girls should protect the chickens from their many enemies: cats, rats, dogs, weasels, skunks, crows, hawks, and owls.

9. The teacher and children can work out a plan for the care of the flock during the summer. The work should be in the hands of one person, an older boy or girl. The flock may be kept at the schoolhouse, which plan has been followed successfully, or it may be taken to the home of the one who is to care for it, provided conditions are right to prevent its mixing with other poultry.

10. The feed for the hen and chickens, both while school is in session and during the summer, should be provided for in one of two ways: (1) The different feeds for the balanced ration should be contributed by the pupils in sufficient quantities to meet the needs, or (2) there should be a school fund to pay for the feed used. The fund may be raised in any way that seems most desirable.

11. In the fall, selections should be made from the flock to exhibit at local fairs, following the directions on page 1169, and any premiums should become the property of the school. After the fairs are over, there should be two or three good lessons given on the entire flock of poultry, in order to sum up the experience gained. For this purpose the records that have been kept by the boys and girls should be used.

12. In disposing of the flock, a certain number of birds should first be given to the boy or the girl who did the summer work. A pen of four pullets and one cockerel would be a just return for the effort, and would make a good start toward a flock of pure-bred poultry. The remaining pullets and cockerels, more or less in number depending on the success of the enterprise, may be sold to members of the school or to their parents, or marketed; the money obtained for them should be placed in the school fund. Unless there are exceptional facilities at the school, the flock should not be kept over winter.

PRACTICAL POULTRY LESSONS

I. TYPES OF FARM POULTRY

O. B. KENT

Nearly all breeds of poultry can be classified in three groups, depending on their use. These groups are the meat breeds, the general-purpose breeds, and the egg breeds.

The meat breeds are very large, are heavily and loosely feathered, and have big frames. They lay a medium-sized dark brown egg, and usually lay well in the winter, but do not have a very good reputation as egg producers. They are rather slow and lazy, and, unless fed carefully, are likely to become overfat. They can stand cold very well. The chicks of this group grow rather slowly but are very hardy. The most common breeds are the brahmas, the cochins, and the langshans.

The general-purpose breeds were developed mainly in America by combining, as far as possible, the good qualities of the meat breeds and the egg breeds. As the name shows, they are intended for both eggs and meat. This group is probably the most popular on the farms in the United States. The general-purpose breeds are from medium to large in size, and make fairly good meat birds. The birds are very active, roaming freely about the fields, and picking up a great deal of their own food. They are extremely hardy, and withstand very hot and very cold weather. The hens make the best mothers, and will hatch and take care of a good many chicks, which grow fairly rapidly and usually are very strong. The hens are very good layers also, and their eggs are medium in size, varying in color from a light to a dark brown. The most popular breeds are the plymouth rocks, the wyandottes, and the rhode island reds.

The egg breeds are those that have been bred almost entirely for eggs. They are from small to medium in size, and their feathers lie nearly flat on their bodies. They are active, nervous, and great fliers. Their small size makes them undesirable as meat birds, but they have a good reputation as egg producers, especially considering the amount of food consumed. The eggs, from medium to large in size, are white and nearly always hatch well; the chicks are quickly and easily raised. However, because of their nervous temperament, the hens cannot be depended on to hatch eggs or to care for chicks. The most common breeds are the leghorns, the minorcas, and the anconas.

It must be remembered that frequently there is a greater difference between the individuals of a breed than there is between the different breeds. Some birds have wonderful records as egg layers, while other hens of the same breed are very poor egg layers. Any of the breeds

can be bred so that they will lay well if given good care. However, more time and attention has been given to the egg laying qualities of the egg breeds than to those of the other breeds.

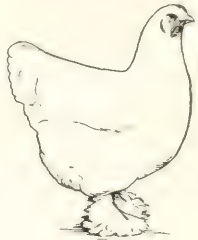
II. THE COMMON BREEDS OF POULTRY

O. B. KENT

The following brief descriptions will help in the identification of the more common breeds and varieties of poultry:

The brahmas are very large birds with fluffy feathers. They are erect

Brahma cock



Brahma hen

in carriage and roundish in shape. The ear lobes are red; the shanks are yellow and are covered with feathers on the outer sides. There are two varieties: the light and the dark. Both have pea combs.

The cochins are large and very fluffy. They have so many fluffy feathers that they appear much heavier than they really are. In shape

Cochin cock

Cochin hen

they suggest a large ball. The ear lobes are red, and the yellow shanks are almost covered with feathers. There are four varieties: the buff, the partridge, the white, and the black. All have small single combs.

The langshans are large and tall. The feathers, like those of the brahmas, are rather fluffy, and there are a few feathers on the sides of the shanks. The tail is almost as high as the top of the comb. The

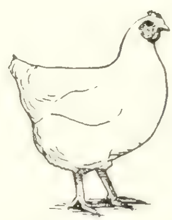
ear lobes are red, and the shanks are black in the black variety, and slaty blue in the white variety. Both varieties have erect single combs.

Langshan cock

Langshan hen

The plymouth rocks are rather large birds with somewhat fluffy feathers. In shape they are rectangular, though not so much so as the rhode island reds. The ear lobes are red, and the yellow shanks are free from feathers or down. The American Poultry Association recognizes the following varieties: barred, white, buff, silver penciled, partridge, and columbian. All varieties have medium-sized single combs.

Plymouth rock cock



Plymouth rock hen

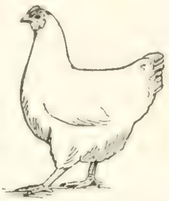
The wyandottes are from medium to large in size with moderately fluffy feathers. In shape they are very round, being known as the breed of curves. The ear lobes are red, and the shanks are yellow and free from feathers. The following varieties are recognized by the American

Wyandotte cock

Wyandotte hen

Poultry Association: silver, golden, white, buff, black, partridge, silver penciled, and columbian. All varieties have rose combs.

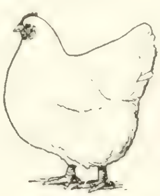
Rhode island red cock



Rhode island red hen

The rhode island reds are fairly large in size with somewhat fluffy feathers. In shape they are very rectangular, with long backs and long bodies. They have red ear lobes, and the shanks, which are yellow or reddish horn color, are free from feathers. The American Poultry Association recognizes both the single and the rose comb varieties.

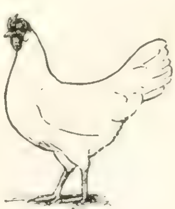
Orpington cock



Orpington hen

The orpingtons are large birds with a great many fluffy feathers, which make them appear larger than they really are. In shape they are deep, blocky, and well-rounded. The ear lobes are red; the shanks are white (except those of the black variety) and are free from feathers. The American Poultry Association recognizes the

Leghorn cock



Leghorn hen

following varieties: buff, black, and white. All have single combs.

The leghorns are rather small birds with fairly close feathers. They

stand very erect and have large wings and tails. The ear lobes are white, and the shanks are yellow and free from feathers. The American Poultry Association recognizes the following varieties: single comb brown, rose comb brown, single comb white, rose comb white, single comb buff, rose comb buff, single comb black, and silver.

The minorcas are fairly large birds with long backs and long bodies. They have very large combs and wattles. The ear lobes are white, and the shanks are black in the black variety, and white in the white variety. The American Poultry Association recognizes both single and rose comb black and white varieties.

Minorca cock

Minorca hen

In studying the breeds, reference should be made to the lessons on the parts of a fowl, the shape and the location of feathers, the color markings of feathers, and the types of combs of the domestic fowl, which have been given in the Cornell Rural School Leaflet in past years, and, if possible, to the *American Standard of Perfection*, published by the American Poultry Association, Mansfield, Ohio.

III. IMPROVING THE QUALITY OF POULTRY

James E. Rice

Only good, strong, pure-bred poultry should be kept in order that both poultry and eggs may be of high-grade market quality. By so doing, the profits may be greatly increased because the selling value of the product will be improved. There will also be more pleasure and satisfaction from the work because there will be pride in the improvement made. The difference in price between the kinds of poultry and eggs that are attractive and those that are unattractive, is enough to warrant great care being taken in breeding for improved quality.

Some of the reasons why pure-bred poultry is more desirable than common stock are:

1. Pure-bred fowls lay eggs that are more uniform in size, shape, color, and texture of the shell. Uniform eggs sell for higher prices than those of various sizes.

2. They are more likely to breed true, that is, the chickens will be more likely to grow up to be like their parents.

3. They are more nearly uniform in shape and size of body and in color of skin and shanks; therefore they are more attractive and more profitable when placed on sale.

A flock of pure-bred barred plymouth rocks. Note the beauty of a flock like this as compared with a flock of mixed breeds

4. They are more attractive as a flock, because they are similar in appearance. It is worth while to keep poultry that looks well.

5. They furnish a larger income because eggs for hatching and stock for breeding can be sold at prices considerably higher than for market purposes.

6. They may be expected to give better results in feeding, hatching, and rearing, due to the fact that they are more nearly alike as to rate of growth, size, temperament, and activity.

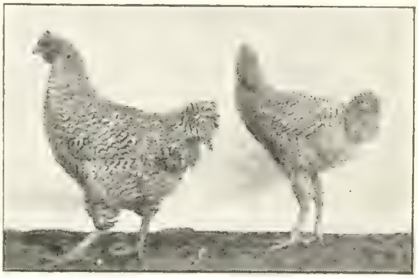
Any boy or girl who is old enough to take proper care of chickens can improve the quality of poultry in two ways: first, by keeping only pure-bred stock, and then by selecting, mating, and taking proper care of the fowls; second, by selecting and using only the right kind of eggs for hatching (page 1154). Both these things should be done, but either one alone will be likely to result in sufficient improvement to warrant the effort of doing it. It is within the reach of all to keep a pure breed instead of a mongrel strain. It is neither difficult nor expensive to obtain in any neighborhood a few pure-bred fowls or their eggs. With these a small start can be made. Each year more and more pure-bred chickens can be reared to take the place of the common fowls until all the flock is pure bred.

A flock of miscellaneous colors and types, such as is often found on the average farm. Cockerels of this sort are of no value as breeders and are poor ornaments

The boys and girls can find out for themselves whether it will pay

better to have a pure breed of poultry than common stock. They should remember, however, that not all pure-bred fowls are good fowls. Whether pure-bred or mongrel stock is kept, it must be vigorous and healthy. In nearly every flock of chickens or fowls there are good ones and poor ones; in some flocks there are exceptionally good ones and exceptionally poor ones. Very likely the good ones are profitable, and the poor ones are kept at a loss. If money is to be made from fowls or chickens, only good ones should be kept.

Every chicken should be regarded as a living machine for making food into meat or eggs. Unless the machine is a good one, satisfactory results cannot be obtained from the food. Many flocks of chickens may be divided into five classes: (1) chickens that are growing and not laying (young pullets and cockerels); (2) those that are laying and not growing (mature hens); (3) those that are growing and laying (pullets); (4) those that are neither growing nor laying (old hens and roosters); (5) those that are losing weight and not laying (old or sick hens and roosters). All five of these groups are eating valuable food, and, if they are all kept together, they will probably eat more than they earn. If the last two groups are disposed of, the others may pay a good profit. There will be less work to do in caring for those that remain, and they will have more room. Moreover, the good chickens by themselves will look far more attractive, will grow better, will lay better, and will be less likely to suffer from disease than they would be if kept with the others.



Strong *Cockerels* Weak

There are several types of unprofitable chickens that should not be kept:

1. A chicken of any breed or age that shows signs of sickness or weakness. All such should be removed at once and doctored, or killed and burned. Prompt action may prevent further trouble. Delay is almost certain, in the end, to have serious results on the rest of the flock.

2. Old hens that may still be well and strong. Generally it does not pay to keep hens after they are three or four years old unless they are strong and especially valuable for breeding purposes. Fowls should be marked so as to indicate their age.

3. Surplus cockerels. They are unprofitable boarders. It is a common mistake to keep too many males. This is frequently due to a natural desire to avoid killing desirable breeders, and to a hope that if they are

retained they may be sold alive for high prices. After they become large enough for market, most cockerels do not make enough growth to pay for the food that they eat. They also injure themselves or others by fighting. The room that they occupy, the food that they eat, and the labor that they require, might better be bestowed on early hatched pullets. Immature cockerels should seldom be allowed to go into winter quarters. They usually fail to grow well in cold weather, and occupy valuable space that should be used by better stock. They are unable to compete with larger individuals and generally remain undersized.

IV. WINTER QUARTERS FOR PULLETS

C. A. ROGERS

As the fall advances the season's flock of pullets should be housed in cozy, warm quarters where they can spend the winter in comfort. This is a time when the chickens should be given careful attention, for the cold nights and the occasional snow flurries soon put a stop to their growth and development if they are exposed.

The pen.— Choose a corner of the barn or the shed that can be partitioned off into a pen of the desired size; or, better still, build a small house for the pullets. If you have fifteen fowls, build the house eight feet wide and ten feet long. If there are twenty-five fowls, make the house twelve feet wide and ten feet long. Be sure to build it on a dry place that is protected from the cold winds as much as possible. Have the front face the south in order to get all the warmth of the sun's rays.

Before putting the pullets into winter quarters, the houses should be thoroughly cleaned and disinfected. New litter should be put in and all signs of disease destroyed

Fresh air and sunlight.— Fresh air and sunlight are two very important factors. Both should be provided through windows on the front (south) side of the house. A small window may be made near the top, into which is fitted a cloth curtain frame. During the daytime in pleasant weather, this curtain should be removed, or, if the frame is swung on hinges, it should be fastened out of the way, thus letting in the sunshine and the fresh air. On cold stormy nights the muslin curtain keeps the house warmer than it would be with an

unprotected opening, and still allows abundant circulation of air. In addition to the cloth curtain there should be a glass window with eight-by ten-inch panes. For the best results this window should be placed one and one-half feet above the floor, and should be high and narrow, not short and broad.

A cheap and very satisfactory type of henhouse. It is neat and warm and gives opportunity for fresh air for the birds

Warmth.— Next in importance is the warmth of the pen, on which depends largely the coziness of the quarters. One of the easiest ways of insuring this is to line the walls with paper and board them up roughly. In addition to this, if the roof is high, build a loose ceiling at a height that allows plenty of headroom, and fill the space above with straw.

Dryness.— The straw not only makes the pen warm, but also keeps it dry. Dryness is equally as important as warmth. With the three walls made tight with paper, the ceiling filled with straw, and a deep litter of straw or hay chaff on the floor, the fowls will be more comfortable and contented. Such conditions always increase the number of eggs produced.

Roosts.— Make the inside arrangements neat and convenient. Small poles or sticks of two-by-four inch lumber make the best perches. All perches should be on the same level, because fowls seek to roost on the highest if some are higher than others. The scrambling for the higher places often results in injury to some fowls and always causes disturbance. The best height for the perch is about two and one-half feet above the floor.

Nests.— By natural instinct hens seek a secluded place in which to lay eggs, and this should be provided. They will be likely to lay more eggs when satisfied with their surroundings. An easy way to make a good nest is to fasten a box on the side wall at about the same height as the perches, leaving a small opening, through which the hen can enter and from which the eggs can be gathered at the side of the box toward the back wall. This nest is very inviting when kept clean and filled with fresh straw or hay.

Freedom.— Fowls should be given their freedom in winter as well as

in summer. This is particularly desirable when the house opens into a dry barnyard in which the fowls can roam about and pick up bits of food left by the other animals.

Cleanliness.— The pen *must* be kept clean. The health and comfort of the fowls depend very largely on this. Do not wait until the litter becomes wet and filthy, but change it as soon as it begins to pack. Provide a small box of screened coal ashes or road dust in which the hens can dust, for this will help to keep the lice off their bodies. Whitewashing the house will help to keep the lice in check; it also makes the pen lighter and cheerier. If necessary, put kerosene on the perches and over the nesting boxes, and refill the nests with clean bedding.

By the method that has been outlined, the pullets can be made comfortable for the winter at a very small cost. The one thing before all others that young poultry raisers should remember is: Provide fowls with wholesome surroundings and they will make it worth your while to keep them.

V. FEEDING FOR WINTER EGGS

C. A. ROGERS

Have you ever stopped to consider that fowls are fond of a variety of food? This is especially so when the weather becomes cold, and they are shut in their pens. Then they are away from the fields where in summer they can nearly gain a living on bugs, scattered grain, seed, and grass. It is true that they will live, even in the winter, on corn and water given them at irregular intervals, but under such care they cannot lay eggs. Notice how much better you feel after a meal of wholesome, well-cooked food that you like. Fowls are just as partial, and when well fed, show their appreciation by filling up the egg basket. There is no one method of feeding that can be applied equally well under all conditions. The method described in the following paragraphs, however, may be followed to advantage under many conditions and may also serve to suggest ways of improving present practices.

Morning feeding.— In the morning the fowls are hungry and ready to work for their breakfast. It is well to let them keep as busy as possible, for work keeps them warm, healthy, and contented. With this in mind, scatter mixed grains in a deep, clean litter. Be rather sparing of the feed in the morning, so that the fowls will not quickly obtain their fill, but will continue to work and hunt for the grain for the greater part of the forenoon. This grain should be a mixture of all the kinds grown on the farm. They may be mixed in the proportion of 2 pounds corn, 2 pounds wheat, and 1 pound oats, to which may be added, if available, 1 pound buckwheat and 1 pound barley. Fresh water should be given to the fowls every morning in clean pails, which should be set up on boxes,

where they cannot scratch the litter into them. Fill the pails again at noon if they are likely to become empty before night.

Noon feeding.— The midday meal is the best one for providing those appetizing mixtures so greatly relished by the fowls and so successful in helping to produce eggs. Take the scraps of meat, bread, vegetables, and oatmeal, from the table; mix them with corn meal, wheat bran, and wheat middlings. Moisten the mass with skimmed milk until it is crumbly. When skimmed milk and table scraps are not available, take a pailful of cut alfalfa or clover hay and pour boiling water on it, allowing it to steam. Feed this while it is still warm. A portion of this steamed alfalfa added to the noon mash gives it a pleasant, appetizing odor. Salt may be added to the mash in about the same proportion as is used in your own food. When it is not convenient to make a moist mash, the same ground feeds may be given dry in a hopper, which should be opened at noon and closed after the hens have gone to roost at night. A good mixture for this purpose is: four parts corn meal, five parts wheat middlings, four parts wheat bran, three parts meat scrap. The best results will be obtained if the hens eat about one-half as much of the ground feed mixture as of the whole or cracked grain. At noontime as much green feed — beets, cabbage, or lettuce — as the fowls will clean up before night, should be given. At this time see that the oyster-shell and grit hoppers are filled. When it is impossible to follow the practice of feeding three times a day, the scraps and the green feed should be given with the morning meal.

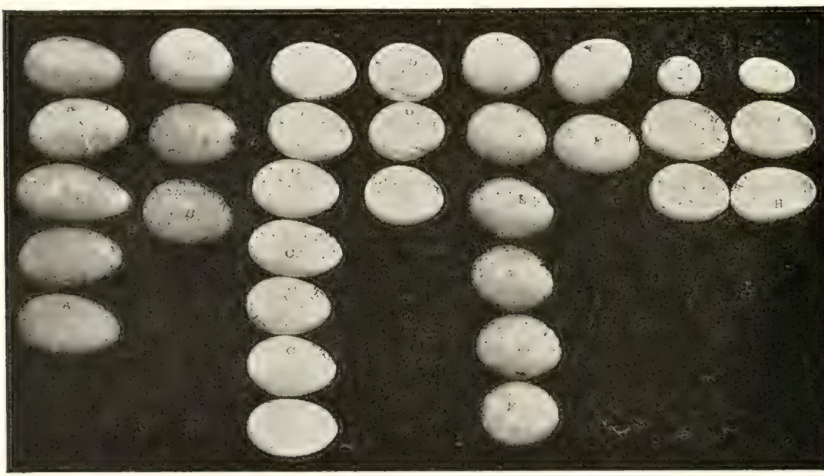
Night feeding.— Fowls go to roost very early, making it necessary for them to eat before sundown. This requires feeding in the latter part of the afternoon, while they can still see to find the grain in the litter. When given the opportunity, a fowl will go to roost with its crop rounding full of grain, which it gradually digests during the night. This process of digestion warms the body and keeps it more comfortable. An empty crop is a poor bedfellow for the fowl. The same grains may be fed at night as in the morning, but in larger quantities, so that some will be left over after the fowls' appetites have been entirely satisfied. The grain that has been left well mixed with the litter at night, gives the birds something to work for in the morning when they come off the roost.

Oyster shell, grit, and charcoal should be kept before the hens at all times, so that they can help themselves whenever they choose. The real secret of securing winter eggs is to give the hens a light, clean house, well ventilated, but having no drafts, and to encourage them to eat heartily of good, clean, wholesome food of as many kinds as can be secured. Changes in the ration should be made somewhat gradually, but best results will be obtained where the hens are given one or two different kinds of food each day, or the same food prepared a little differently.

VI. SELECTING AND KEEPING EGGS FOR HATCHING

JAMES E. RICE

One of the easiest ways to increase the money-earning value of poultry is to improve the quality of the eggs. The best customers usually are willing to pay a higher price for eggs of superior quality. Frequently this difference in price is as high as from five to ten cents a dozen. Each hen in a good flock should lay on the average from ten to eleven dozen eggs a year. If the eggs are of such quality that they will sell for even two cents more a dozen than ordinary eggs, this would mean a net difference of about twenty-five cents a hen in a year. This extra price is nearly all clear profit, due to the uniformity in size, shape, and color of the eggs.



Groups of eggs showing the various sizes and shapes that are obtained from almost any flock. All the eggs in the same row were laid by one hen. Note that the eggs laid by one hen have a characteristic shape. Only uniformly shaped eggs should be marked as first-class

The kind of eggs that brings the highest price will depend somewhat on the market. The poultry raiser should first find out what kind of eggs will bring the highest price and pay the largest profit in his market; then produce that kind only.

There are several things that can be done that will help to improve the selling quality of the eggs:

1. A pure breed of poultry that will lay eggs as nearly as possible the right size, shape, and color to meet the requirements of the market, should be kept. Such fowls cost little, if any, more to keep than fowls that lay an inferior quality of eggs.

2. Only those eggs should be used for hatching that are of best market

type as to size, color, and texture. Pure-bred fowls will be likely to lay eggs similar to the eggs from which they were hatched. In other words, the kind of eggs that are selected for hatching will determine the kind of eggs that will be laid by the chickens that are hatched.

When eggs from the same variety of fowls are compared, the size of an egg apparently determines to a considerable extent the size of the chicken that will hatch from it. Therefore, in order to have chickens of good size, good-sized eggs must be set. Hence, there are at least two good reasons why all the eggs that are selected for hatching should be full size, perfect in shape, and of the right color and texture.

Eggs for hatching should weigh at least two ounces and should not exceed two and one-half ounces each. They should be perfect in shape so that they will pack well in the shipping case, that is, so that they will fill the compartments without danger of breakage from top or side pressure. They should be uniform in color, that is, each egg should be of one color and the right color over its entire surface, and all the eggs in the case should be of the same color. The two colors that are most in demand are pure white and pure brown. There are many degrees of white and of brown in eggs, which will be seen only when the eggs are carefully examined in a good light.

The texture of the eggshell should be smooth, hard, and free from transparent spots when examined with a tester. Eggs having defective shells are not so likely to hatch well or to produce strong chickens.

Eggs for hatching should be kept in a moist, cool place not over 50° to 60° F. and for not more than a week or ten days if it can be avoided. They should be turned every day or two, and should be kept covered so as to prevent too rapid evaporation.

Selecting eggs for hatching is interesting and useful work for any boy or girl. It will also prove to be profitable work.

VII. HATCHING EGGS WITH A HEN

Clara M. Nixon

Every one who has tried to set and care for a hen so that a good brood of healthy chickens will hatch, knows that it is no slight task. Education is needed for this as well as for other kinds of work.

The hen.— The hen should be all ready to receive the eggs when they arrive. She should be of moderate size. If too heavy, she may break the eggs; if too small, she can cover a few only. She should be quiet and peaceable, a hen that may be handled without being frightened, and one that is likely to stay on her nest in a businesslike fashion.

Do not trust the hen with valuable eggs until you are sure she intends to sit. It will be better to give her two or three other eggs (china eggs

will do) and let her sit on these for two or three days. She will probably be more contented on the nest that she has chosen for herself, if it is a suitable one.

Sitting hens should be separated from the rest of the flock and placed in some quiet, cool retreat

In case you must change the hen to another place, go quietly after dark, lift her gently, and put her on the nest that has been prepared. Give her two or three eggs, one at a time, and let her place them under her breast as best pleases her. If she clucks contentedly, and snuggles the eggs cozily under her feathers, she will usually sit on this nest. It is best, however, to put a crate or a well-ventilated box over the nest. The top should be high enough not to disturb her while sitting, but not high enough to allow her to stand comfortably. If she sits quietly for two or three days, she will probably stay, and you may give her the setting of eggs. Keep the crate over her for a few days longer, allowing her to get off the nest every day for exercise, food, and water, but have her go back in a reasonable time.

The nest.— Have the nest comfortable, clean, and free from lice. It should be large enough for the hen to change her position on the nest and to turn her eggs, but not so large that the eggs will move out of the warm hollow under her breast. First, place some earth in the bottom of the box, then enough bright clean hay to make a good nest; the hen will fix the curve of the nest to suit herself. She feels safer in a somewhat dark, secluded place, and it is best to humor her.

Care of the hen.— The hen has undertaken a very confining task, which will last three weeks. This is a long time. For twenty-one days and nights she must stay in almost the same position. If you do not think this is tiresome, watch her when she first comes off the nest. She can scarcely stand. The least that a person can do is to have things as well prepared for her comfort as he can. Plenty of whole grain (corn and wheat are best), clean, fresh water, grit, and a dust bath should be placed where she can reach them, and she should be allowed to exercise every day if she wishes. Be sure to dust a little lice powder into her feathers occasionally. This is a wise precaution, even if you do not find any lice. In case she should break an egg, clean up the nest as well as you can, and wash off the badly smeared eggs in lukewarm water. They will not be likely to hatch if not cleaned.

If the hen seems irritable when the eggs begin to hatch, the oldest chickens may be taken from the nest as soon as they try to get from under the hen, wrapped in a piece of flannel, and kept in a warm place until the others are out. This will keep the hen more quiet, and she will not be likely to kill the younger chickens in the nest or to leave the nest before the remaining eggs are hatched. If the hen is quiet, it is best not to disturb her while the eggs are hatching. The nesting box must be deep enough to prevent the chickens from jumping out.

With careful attention to the instructions given, you should have good success with the eggs.

VIII. HATCHING EGGS WITH AN INCUBATOR

H. P. Buchan

The room.— If an incubator is used for hatching eggs, it is usually best to follow, so far as possible, the instructions sent with it. Most incubators will produce the best results if they are located in a room where the temperature does not vary much, where the air can be kept fresh by good ventilation and moist by keeping the floor wet. A clean, well-ventilated cellar comes nearest to the kind of room desired.

Starting.— In order that the incubator shall work properly, it should set level. Lay a carpenter's level across the top and put little wedges under the legs until it is level each way. See that every part of the incubator is in place. Warm the incubator with a rather low flame until the thermometer shows a temperature of 103° F., then turn down the thumbscrew until the little disk over the heater is raised about an eighth of an inch above the opening. After the temperature has remained 103° for several hours, the eggs may be put in. It is usually better to put the eggs in the incubator in the morning so that the temperature can be watched closely while the eggs are being warmed to the proper temperature. The germ within the egg is very delicate during the first five or six days, and, if the temperature goes above 103°, it is very likely to be injured and is sometimes killed.

The lamp.— The lamp should be filled and the wick trimmed every morning. Be very careful about trimming the wick. It is better to brush off the charred part than to cut the wick. Have a piece of cheesecloth handy for wiping the lamp and the burner clean every time the lamp is filled.

Turning the eggs.— Beginning with the morning of the third day, turn the eggs each morning and each night. In order to do this, remove the tray from the incubator, place it on top of the incubator or on a table, and roll the eggs on the tray with the palms of the hands. They should be rolled in such a way that the eggs in the center will be moved toward

the outer edges of the tray, and those at the outer edges toward the center. It is not necessary that each egg be turned exactly halfway over. When handling the eggs, care should be taken that no kerosene touches them, for it will injure the growing germs within the eggs.

Cooling the eggs.— While the eggs are being incubated, and the chickens are developing within the shells, they need a large amount of fresh air. One of the ways of providing this is to leave the tray containing the eggs outside of the incubator for a short time after the eggs have been turned. This is called cooling the eggs. During the second week the eggs may be cooled for a short time each day after they have been turned in the morning and while the lamp is being cared for. During the third week the eggs may be cooled both morning and night. The length of time that the eggs may be cooled, depends a great deal on the temperature of the room. They should not be cooled until they feel cold to the hands, but they should be slightly warm when returned to the incubator.

Care of the incubator after the eighteenth day.— The eggs should be turned and cooled for the last time at the end of the eighteenth day. The incubator should not be opened again from this time until the hatch is completed. The lamp should be cared for as usual, and the temperature should be watched carefully. The eggs are giving off a considerable amount of heat at this time, and the temperature is inclined to rise very high, but it should be kept down to 104° F. by lowering the lamp flame. If the temperature runs up to 105° F. for a short time, no harm will be done. Very often when the hatch is nearly over, the temperature will go down very rapidly. Care must be taken that this does not happen because a low temperature at this time will injure the wet chicks.

Cleaning the incubator.— As soon as the chicks are through hatching, the incubator should be opened and the egg tray and all eggshells removed. If there are any ventilators, they should be opened at this time. In the absence of sufficient ventilation the door may be opened slightly to prevent the chicks from panting. The chicks should be left in the incubator about twenty-four hours and then removed to the brooder.

The incubator is always more or less soiled after a hatch is completed and should be thoroughly cleaned by washing with warm soapy water. It is also well to disinfect the incubator after every hatch, for this will help to prevent disease among the little chicks. The incubator may be disinfected by spraying the inside with a pint of warm water containing a tablespoonful of zenoleum, creolin, or any other good disinfectant, which can be purchased at a drug store.

Editors' note.— Many older boys and girls operate incubators in the spring. It is worth while to know how chickens may be hatched artificially with an incubator, as well as naturally with a hen.

IX. BROODING AND CARE OF CHICKENS WITH A HEN

CLARA M. NIXON

When the eggs are hatched, as they should be by the end of the twenty-first day, take the hen and chickens from the nest and put them in the coop that you have prepared for them.

The coop.— The coop should be large enough to permit the hen to move about, and high enough for her to stand comfortably in it. If it has no floor, set the coop on a platform of boards. This will help to keep out rats and weasels, as well as to keep the coop dry. The separate floor

The first meal. After chicks have been hatched for from 24 to 36 hours they will begin to hunt for food. Feed little and often. Provide fine grit and pure water at all times and a clean grass sod for pasturage

is more easily cleaned and dried. The coop should be slatted in front, but closed on the other sides; it should have a roof that will keep out the rain. It should face the south and be placed on clean ground on which no chickens have recently been reared. This is a precaution against disease. Everything should be clean, thoroughly disinfected with a coat of white-wash, and kept dry. Dampness is fatal to young chickens.

During hot weather a shelter against the heat should be arranged on the south side, unless the coop is located in the shade. The coop should be turned over often and the floor set up on edge, so that the sunshine may dry and cleanse every part.

Care of hen and chicks.— It is usually best to keep the hen and chickens confined to the coop for the first day or two. After this the chickens may be allowed to run in a small covered yard attached to the coop. This may be made by using three wide boards for the sides with some poultry wire stapled on the top. After a few days, if the weather is good, this yard may be removed and the chickens allowed to run. They will not go far from the hen. As soon as the chickens can run well, the hen may be allowed her freedom, but she should be fed near the coop and shut in it every night. In the early morning when heavy dew is on the grass, it is best to keep the hen in until the grass is nearly dry. In rainy weather the hen and chickens should be kept out of the wet.

Enemies and disease.— Be sure that the hen and chickens are free from lice. A wise precaution against these pests is to apply a little fresh lard to the hen's body under the wings. An equal quantity of scotch snuff mixed with the lard makes it more effective. A liberal application of two parts kerosene and one part crude carbolic acid to the inside of the coop several days before the hen and chickens are placed in it, will be a wise precaution against red mites. In case of the mysterious disappearance of the chickens, look for cats, rats, crows, hawks, weasels, and other thieves. Crows and hawks catch the chickens in the daytime, when they are roaming about. Rats and weasels often get into the coop at night, and may destroy an entire brood in one visit. Cats are often enemies. Your pet cat may be the one to eat your chickens. Watch her until you know she is to be trusted.

The loss from disease will be greatly decreased if the chickens are always well cared for and well fed and if their coops are kept clean and dry.

X. CARE OF BROODER AND CHICKENS

H. P. BUCHAN

Location.— In locating the brooder select a spot that is dry and protected as much as possible from the cold winds. During warm weather the brooder should be shaded from the hot sun in the middle of the day. It should be set as nearly level as possible; the floor should be covered about one inch deep with dry chaff or cut straw to help keep the chicks warm.

Temperature.— About the time the chicks begin to hatch in the incubator, the lamp or the heater in the brooder may be lighted, and the temperature under the hover allowed to rise to 100° F. A higher temperature is likely to be harmful unless the weather is very cold. Keep the temperature as near 100° F. as possible during the first two weeks. After this it may be lowered about 5° each week, until the chickens no longer require heat, which will be when they are from six to eight weeks old.

Removal of chickens to brooder.— When the temperature in the brooder has been running steadily at 100° F. for a few hours, and the hatch is completed, the chickens may be moved to the brooder. Care should be taken that they are not chilled at this time. A basket or a box lined with flannel is good for this work. The chickens should be removed to the brooder about an hour before dark in order that they may spend the first few hours quietly under the hover. They should be placed under the hover when they are brought from the incubator. This teaches them quickly where to find the heat.

Management.— If the brooder is large, the chickens should be kept from wandering away from the heat by means of some boards set up around the hover. These boards may be moved out a little each day until they can be removed permanently. After the chickens have been moved to the brooder, they should be watched until they are settled for the night. It would also be well to look at them again two or three hours later in order to be sure that everything is all right. If the temperature under the hover is right at this time, some of the chickens will be peeping out from under the felt around the sides of the hover. If none of the chickens can be seen, and if they are all back under the hover, there is danger that the temperature may drop too low before morning.

Outdoor run.— During the first two or three days the chickens may be confined to the brooder, but as soon as they have the run of the whole brooder floor and have learned where to find the heat when they need it, they may be allowed to run out on the ground if the weather is favorable. Some sods may be piled by the exit door so that it will be easy for the chickens to run out and in. In order to prevent the chickens from wandering too far from the brooder, a small yard may be made by setting up some wide boards. This enclosure should be very small at first and may be enlarged a little each day. When the chickens are let out on the ground, they should be watched carefully the first day to be sure that none of them remain out long enough to become chilled.

Cleaning the brooder.— If the young chickens are to live and grow satisfactorily, everything around them must be clean and sanitary. The brooder should be cleaned often, and new chaff should be put on the floor. Never let the floor become bare, for a bare floor is cold, easily soiled, and therefore very injurious to young chickens.

Disinfecting.— In order to avoid disease it is a good plan to spray the inside of the brooder occasionally with disinfectant. One of the small hand sprayers of the plunger type is satisfactory for this work. A good disinfectant can be made of one quart of warm water and two tablespoonfuls of zenoleum, creolin, or any good stock-dip, which can be purchased at a drug store.

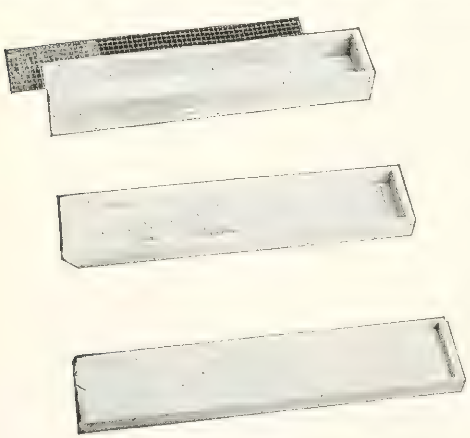
Preventing parasites.— The chickens should be examined occasionally to see whether there are any lice on them. If lice are found, a little fresh lard should be rubbed under the chickens' wings and on their heads. Sometimes young chickens are attacked by head lice, which so weaken them that they soon die.

Another parasite, which sometimes causes a great deal of trouble, is the poultry mite. This mite does not like sunlight so it lives in the cracks and the dark corners of the brooder, and at night comes out of its hiding place to feed on the blood of the chickens. When the mites are present in large numbers, the chickens soon show the effects by losing their appetites, becoming weak, and huddling under the hover as if they were cold. Mites should never be allowed to become established. This can be prevented by painting the inside of the brooder with a good lice paint at the time the brooder is set up and once every month while it is being used. Care should be taken to get the lice paint into all the cracks because there the mites are most likely to be found. Nearly every drug store has lice paint for sale, but a good one can be made by mixing one quart of kerosene with one pint of crude carbolic acid.

XI. FEEDING YOUNG CHICKENS

Clara M. Nixon

The feed.— The egg yolk is enclosed within the body of the chicken just before hatching, and supplies nourishment to the chicken after it leaves the shell. For this reason chickens should not be fed until they are thirty-six hours old. The first meal may consist of rolled oats, bread crumbs, sifted beef scrap, and bone meal mixed in the following proportions: 8 pounds rolled oats, 8 pounds bread crumbs, 2 pounds sifted beef scrap (best grade), and 1 pound bone meal. Take as much of this mixture as is needed for the first meal and moisten it with a little buttermilk or sour skimmed milk. Use just enough milk to make the mixture crumbly, not sloppy. Sprinkle over this feed a very little fine grit, such as is sold for pigeons, and some finely shredded clover, lettuce, or chickweed.

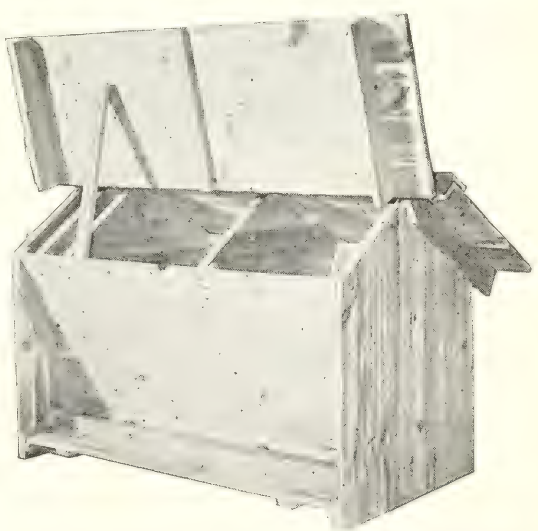


Chick feed-trays of different sizes

In addition to the moist feed, grain should be given. A good mixture is 3 pounds cracked wheat, 2 pounds finely cracked corn, and 1 pound pinhead oatmeal, rolled oats, or hulled oats. A dry mash may be left before the chickens at all times, but only as much should be given at one time as will be eaten in a day. If any of the mash becomes dirty, it should be removed. The mash may consist of 4 pounds wheat bran, 3 pounds wheat middlings, 3 pounds corn meal, 3 pounds sifted beef scrap, and ½ pound bone meal, well mixed together. Beef scrap that is not perfectly fresh should never be used. For chickens four weeks old or over, the portion of bran may be reduced to three pounds.

Cottage cheese may be given in addition to the other feeds, but not in large quantities. It may cause bowel trouble if the chickens eat too much at first. Sour milk is a very valuable food for young chickens and should always be used when it can be obtained. It seems better to moisten the mash with it rather than to feed it separately when the chickens are very young. All foods should be sweet and clean, never moldy nor sour. All changes in the ration should be made gradually.

Method of feeding.— Care should be taken to have the hen well supplied with whole grain and large grit. The chickens should be fed often at first, usually five times a day. The moist feed may be given in a shallow dish or on a piece of clean board, and should be taken away as soon as all the chickens have had enough. During the first few days they will probably eat but a small amount of grain; it may be scattered in a shallow dish containing a little dry mash made according to the formula given. After two or three days, the dry mash alone may be fed in the dish, and the grain scattered on the ground or the floor. Two meals of the moist feed may then be given, the other feedings being of grain. The dry mash may be left where the chickens can get it at any time. After the first week the bread and the rolled oats need not be given, but a little of the dry mash may be moistened and given instead.



The interior of the outdoor feed hopper, showing compartments that may be used for grain, dry mash, grit, and beef scrap

As the chickens grow older, the number of meals may be decreased, and larger grain may be fed. At four or five weeks of age chickens will be able to eat whole wheat, hulled oats, and medium cracked corn. Then, if they have a large range and the weather is favorable so that they may run about, they need only two meals of grain and one of moist mash a day. They can always come back to the dry mash if they become hungry. Beginning with the first meal, green feed should be supplied, but the hen will soon teach the chickens to peck at tender pieces of clover and the like, if she is allowed to range with the brood. If a brooder is used, the chickens may be permitted to run out on clover sod at the end of the first week if the weather is favorable.

When the chickens are about eight weeks old, the grain and the ground feed may be given from a large feed hopper, from which the chickens may help themselves at any time. The grain mixture may consist of equal parts of wheat and cracked corn. The chickens should also have free access to cracked bone, fine grit, screened oyster shell, and charcoal.

Chickens should have plenty of fresh, clean water in a vessel into which they cannot jump. Ordinarily a water fountain is used for this purpose, and a serviceable one can be made from a pint basin and a tomato can. Cut half-inch notches in the can on opposite sides, fill it with water, cover it with the inverted basin, and turn the whole over, holding basin and can tightly together. The water will run into the basin but will not overflow. If the basin does not become full enough, cut the notches higher.

XII. FATTENING POULTRY

W. G. Krum

Fattening poultry means feeding it in such a way as to produce large, soft muscles with sufficient fat so that when cooked they are tender, juicy, and of fine flavor, rather than filling a fowl's body with a large deposit of oily fat, such as is often found in old hens. Not only does proper fattening improve the quality of poultry for home use, but it also increases the market value.

The best method of fattening poultry is to restrict exercise by placing the birds in slatted coops about two feet square, with the bottom slatted or covered with wire cloth of one-half-inch mesh. This will hold from four to six fowls or from eight to ten young birds. The coop should be located in a cool, shady place in hot weather and in a comfortable place in cold weather.

Fairly good results can be obtained by confining the birds in small yards in connection with the poultry house and by feeding them as though they were in coops. This method of fattening poultry usually requires a longer time than the coop method.

The fowls should be thoroughly dusted with lice powder, because fowls infested with lice do not fatten well. They should not be powdered during the last five days of fattening, for some powders taint the flesh. Only healthy, vigorous fowls should be selected, for it is almost impossible to fatten fowls or chickens of low vitality.

Poultry should not be fed for from twenty-four to thirty-six hours before feeding the fattening ration, which should be fed sparingly at first. Afterwards the fowls should be fed only as much as they will clean up in from ten to twenty minutes. If they have more than they can digest for a meal or two, they lose their appetites, fail to grow well, and may lose weight. Fowls or mature young stock should be fed three times daily for about two weeks, which is as long as they will do well under such heavy feeding.

A good fattening ration consists of 3 pounds corn meal, 3 pounds buckwheat middlings or ground buckwheat with hulls removed, 3 pounds red-dog flour or white wheat middlings, 1 pound beef scrap, and a little charcoal. This mixture should be moistened with sour skimmed milk or buttermilk (the latter preferred) to the consistency of batter, which is then allowed to stand and sour twelve hours before feeding. Ten pounds of the dry mixture usually require from seven to nine quarts of milk.

Poultry may be fattened in coops or small pens arranged in the shade. Wet mash may be fed three times a day in troughs

It is usually best in fattening broilers to give this ration at morning and night only, and to give at noon a light meal of cracked corn and wheat.

While the fowls will not use very much grit or water, yet it is best to keep them where they can help themselves at any time.

When poultry fattened in this way is shipped to market, the packages should always be marked "milk-fed," for this brand of poultry brings an extra price.

Ordinarily in selling poultry from the farm it is marketed direct from the range without fattening, and, because the birds are not in good condition, they do not bring a high price. Two weeks of fattening should increase not only the number of pounds, but the quality of the flesh as well. A bird with firm, heavy drumsticks, a plump full breast, and a well-fleshed keel will always bring a higher price and more than repay the extra expense and labor of fattening.

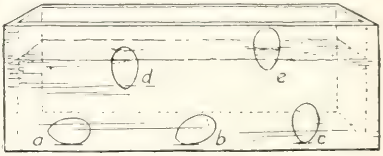
XIII. CANDLING MARKET EGGS ON THE FARM

Earl W. Benjamin

Few persons realize the delicate structure of an egg. If it is kept at a temperature of 65° F. or more, it will become heated; if it is allowed to be cooled to 28° F. or lower, it will become chilled or frozen; if it is kept where the air is dry, it will become evaporated; if it is kept where the air is moist, it will become molded or musty; if it is handled roughly, the air cell will be broken; if the shell is cracked, bacteria may enter and cause decomposition.

Homemade candling device

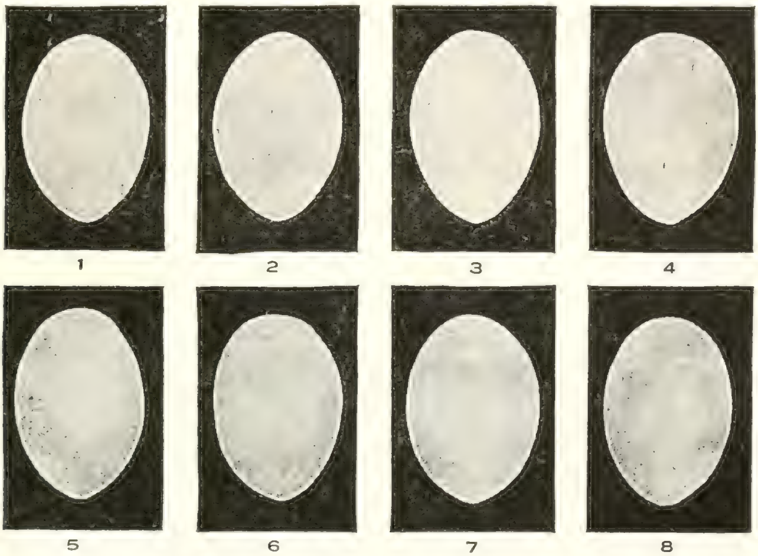
Market eggs should be sold frequently, for eggs will spoil in a short time if they are kept under wrong conditions. Candle the market eggs just before they are sold, and see how they look. An efficient candling device may be arranged as shown in the illustration. It is constructed by wrapping a piece of cardboard around an ordinary lamp. Cut one hole in the cardboard for turning the wick and another about 1¼ inches in diameter for candling the eggs. Have the room darkened, hold the egg against the opening in front of the light, and give the egg a quick twist which will start the contents of the egg in motion so that their condition may be determined. Arrange the apparatus so that you can look down on the egg while candling it; you can observe the size of the air cell better.



A good test for stale eggs can be made by putting them into a dish of pure water. a, *A very fresh egg. This lies flat on the bottom of the dish.* b, *A slightly stale egg. This tips up slightly and is not of first-class quality.* c, *A stale egg. Eggs that stand on end should not be sold; they may be used at home if they appear good when opened.* d, *A very stale egg. This is probably unfit for food use.* e, *A dried egg. Such eggs are of no value for food*

A fresh egg will look clear with the exception of an indistinct shadow made by the yolk. The air cell will be about the size of a dime. The yolk of a heated egg will look darker than that of a fresh one. Experience teaches a person to recognize a heated egg quickly. An egg that is evaporated will have a larger air cell than

a fresh one. Compare the appearance of the eggs examined with that of eggs in the different stages of evaporation shown in the figure on the opposite page. Fresh eggs often contain clots of blood or other substances, which appear as dark spots floating in the egg. Such eggs may



Rate of evaporation of hens' eggs, held at ordinary room temperature. The rate of evaporation could be greatly lessened by keeping the eggs cooler and by having more moisture in the air
1, A newly laid egg. When an egg is just laid and not yet cooled, it has no air cell at all. While it is cooling, however, the contents contract, and an air cell of the size shown here is formed. The air cell is usually at the large end of the egg
2, An egg one week old. The size of the air cell continually increases, due to evaporation of the moisture
3, An egg two weeks old. Such eggs are not of first quality
4, An egg three weeks old. By this time the white of the egg begins to weaken
5, An egg four weeks old. The yolk appears as a darker shadow than before
6, An egg five weeks old. Eggs evaporated as badly as this should not be sold
7, An egg six weeks old
8, An egg seven weeks old

often be used at home, but should not be sold with the regular market eggs. The best success will be obtained by selling only eggs that are strictly fresh as determined by candling.

Editors' note. — No part of the poultry business is more important than the marketing of the product. In order to be most successful and to sell at the best price, one must establish a reputation for quality and never depart from it. The article on "Candling Market Eggs" and the one on "Grading and Packing Eggs" emphasize this thought. The candling device makes it inexcusable for a poultry raiser to sell a poor egg along with good ones, and he should always sell a product that is guaranteed to be what it is marked to be.

XIV. GRADING AND PACKING EGGS FOR MARKET

E. W. BENJAMIN

In order to sell eggs most profitably, the poultry raiser should know how to grade and pack them for market.

As soon as the eggs are gathered, sort out all the soiled ones and clean them. If they are only slightly stained, use a cloth moistened in water; if they are badly soiled, use scouring soap or a like substance. Do not soak eggs in water, for they will absorb undesirable flavors. Washed eggs will not keep so well as clean, unwashed ones; therefore it is better to keep the washed ones for home consumption and use them while they are fresh.

Market eggs should be carefully sorted and packed. In order to grade eggs for private trade, make two groups according to size. The first group should contain eggs each weighing two ounces or more, that is, one and one-half pound or more a dozen. The second group should contain eggs weighing less than two ounces each. The grading will be easier if a few eggs of two ounces each are weighed and used as samples. Practice will enable one to grade eggs without weighing them. From each group of eggs take out all except those having approximately the same color, either uniform white or uniform brown, and the same shape. After all the eggs of small size, poor color, and abnormal shape have been taken out, there will be two grades of first-class market eggs for which you should be able to obtain higher prices than the ordinary market will pay. Egg dealers in New York City have been known to pay ten cents more a dozen for the large eggs than for the medium-sized eggs of the same color. They have also paid from five to eighteen cents more a dozen for the uniformly white eggs than for those of mixed color of the same size. The eggs that go into the cull grade may often be sold for nearly market price.

The best grade of eggs produced for the wholesale trade should be packed in an ordinary case containing thirty dozen if express shipments are to be made. A producer may be able to supply some private customers in the city. This class of trade is not difficult to obtain if the eggs are of superior quality. Establish a standard for each grade of eggs sold and see that the eggs always conform to this standard, so that customers will learn to expect and appreciate thoroughly high-grade products. Consumers are usually glad to pay a premium for eggs of reliable quality. With a little care and interest on the producer's part he can establish a business that will afford some of the best profits and pleasures of farm life.

Remember the following suggestions: (1) breed and select your fowls so that they will lay eggs that are uniform in size, shape, and color, and

of the quality that will best suit your customer; (2) do not allow male birds with the laying hens during warm weather; (3) gather the eggs daily; (4) keep the eggs clean; (5) carefully clean all soiled eggs; (6) sort the eggs into at least two grades; (7) neatly pack the first-grade eggs in cartons or other attractive packages, and they will command a considerable increase in price; for local customers, grape baskets, four-quart peach baskets, and the like, can be used to advantage; (8) furnish your customer each time with a uniform grade of eggs; (9) up-to-date knowledge combined with attention to details, absolute honesty, and good business methods will bring success.

XV. EXHIBITING POULTRY

W. G. KRUM

Boys and girls who own good poultry should take great pride in exhibiting it at fairs, especially such as are being held in many rural schools each fall.

A rural school poultry show

Birds at regular fairs and poultry shows are exhibited in *singles* or in *pens*. A pen consists of four females and one male. Poultry exhibited at school fairs is usually shown in pairs, one male and one female.

When birds are exhibited, they are on dress parade, and they should present as fine an appearance as possible. Fanciers prepare birds for

poultry shows by washing them in warm water, using plenty of ivory soap. Take the feet in one hand, and gently hold the body under the water. Be careful not to get water or soap in the bird's eyes. Squeeze or sponge the dirt from the feathers, but do not rub them. When the dirt is off, rinse the bird in lukewarm water until all the soap is out of the feathers. Scrub the feet clean. Dry the birds in a hot room or in a clean coop before a hot fire. If it is impossible to wash them in this way, it would be a good plan to sponge off some of the dirt from the surface of the feathers, using a small amount of gasolene in the sponge. Do not handle gasolene near a fire. The comb, wattles, beak, and feet should be washed with soap and warm water.

A good exhibition coop for a pair of fowls may be made at home, and should be about two feet square and two feet high, having a slatted front with two of the slats removable so that the judge can take the birds out if necessary. Grain and plenty of water should be provided during the exhibition. Tin cups may be used, and they should be fastened on the outside of the coop within reach of the birds. Plenty of clean shavings or fine straw should be sprinkled on the floor of the coop.

The principal things to consider in selecting birds for exhibition are size, shape, condition, and color. The parts to consider separately under shape and color are comb, head, beak, eye, ear lobes, neck, wings, back, breast, tail, body and fluff, legs, and toes. Under condition, the points to consider are cleanliness and health. The birds may be judged by the *American Standard of Perfection.* This type of judging will help the boys and girls to know good poultry at sight. (See editors' note.)

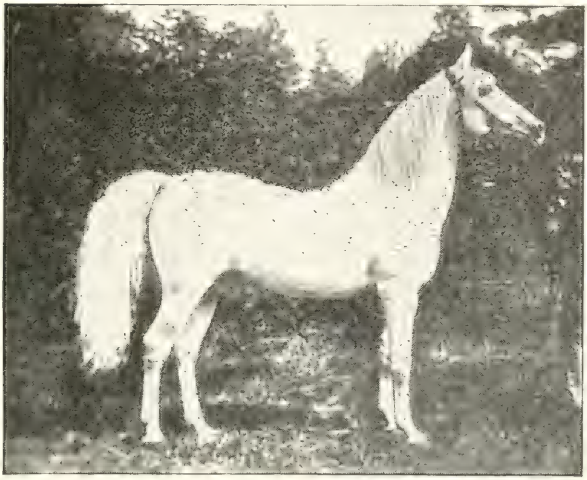
Editors' note.— The article on exhibiting poultry is published because many schools are holding poultry shows, and, at almost all school fairs, there is poultry exhibited by boys and girls. Very often the birds are not properly selected nor well cared for, and the suggestions made by Mr. Krum as to the number of birds to exhibit, the size and the arrangement of the coop, and the care of the birds while confined, should be helpful.

Poultry judging involves a wide knowledge because each of the varieties has individual points. The best way to help the boys and girls to the knowledge of how to select their birds for exhibition is to have some poultry man give them lessons illustrating the points of some particular variety. A number of such lessons covering the chief types and breeds would be valuable and would give the children ability to determine between good and poor birds. The *American Standard of Perfection* is a book issued by the American Poultry Association, and is the basis for all judging at poultry shows.

ANIMAL STUDY

NOTES ON THE HORSE

THE EDITORS



An Arabian horse

The horse is given for special study this year, and the work will present difficulty to a large number of rural teachers. Many have frankly stated that they cannot conduct a lesson with a horse because they have not had enough experience to make them at ease with horses. Other teachers, however, have given some very excellent lessons following the subject matter given in previous leaflets, and have begun the work by having a horse on the school grounds. In some cases a farmer has brought a horse to the school; in other instances a boy has brought a horse from his home for the lessons; and some teachers have gone to a farm where there were good horses, and have secured the cooperation of the owner in giving instruction.

Although a teacher may feel that she cannot have a horse brought to the school for a lesson, she will be able to direct a good deal of valuable study that can be done at home. Observation and reasoning can be developed from an intelligent study of animal life on the farm, and when such study becomes a part of the school work, the efforts of the children are at once dignified, and the interest is much more manifest. Each teacher will have a different method of working out the lessons for the year. However, a few suggestions are given here that may be helpful to young teachers, and that may add live interest to the topics.

As a part of his education a child ought to consider the contribution that horses make to human lives. The class should consider the different uses made of horses at the present time. This will awaken a good deal of thought. The next consideration should be the attitude of mankind to this contribution — what is done for horses in return for their helpfulness. The children might write an autobiography of one of the horses at their homes; nearly all school children have read *Black Beauty*, and it will interest them to do this. They can learn from their fathers some of the facts relating to the lives of their horses — facts that they have never known although the horses may have been on the farm for some years. In the autobiographies they might have the horses tell where they were born, how many masters they have had, what work has been given them to do, what kind of care, housing, and food have been provided for them, about illnesses they have had, how these illnesses were treated, what they expect in looking forward to old age, what special kindnesses have been received, and the like. Work of this kind will lead to more interest in the horse than, perhaps, any class exercise.

No lesson in the following pages will lead the children to keener observation of horses than that on the proportions of the horse. Some teachers have had the measuring instrument for this lesson made at school, and this is valuable handwork. After the children have learned to use this instrument, they might enjoy taking turns in using it to measure the horses at their homes or at some other farm in the neighborhood where they are acquainted. Careful records should be kept of the proportions of the different horses measured. In this way it will be possible to determine fairly closely the best-proportioned horse in the neighborhood, and the horses that most nearly approach this one. It would also be valuable, once this information is obtained, to know more about the horses that are most nearly perfect in form, that is, to find out something of their past history, their value, whether they are in good condition, something about the care that is taken of them, and like matters of interest. It will usually be found that good proportion is directly connected with good breeding.

In connection with the lesson on feeding the horse, the children should bring to school samples of some of the different kinds of feed given to horses on their farms. These samples can be neatly arranged so that all the children can see them, and a discussion of feeds will then have a greater interest.

Last year the editors of this leaflet offered to send a book about horses as a reward to the school that would prepare the best notebook on the horse and send it to the College by May 1. They were exceedingly pleased with the work that was received. Many schools collected material

that was not sent because not sufficiently complete; therefore, the opportunity will be given again this year to schools to prepare notebooks, and a first, a second, and a third prize will be awarded for them. The notebooks will be judged on the value of the information contained in them, with particular emphasis on first-hand knowledge that the boys and girls show of horses in the neighborhood, which has been obtained by observation, study, and discussion. The attractiveness of the work and the character of the illustrations will also be considered. The notebooks should be sent to the Editors Cornell Rural School Leaflet, College of Agriculture, Ithaca, New York, on or before May 1, 1916. A suggestive list of topics that would help the children in the preparation of the notebooks follows:

1. An account of the origin and the development of the horse. How did the earliest horses differ from those of the present time?

2. Information as to what constitutes a well-proportioned horse. Every boy and girl should make a drawing of a horse that is well proportioned.

3. Types of horses. How many types are there in the neighborhood? Report of a survey made to learn the number and the value of each type. This will be a good experience for the older boys and girls.

4. The habits of the horse as determined by observation. This includes such things as how it lies down and gets up, how it sleeps, how it walks, trots, or paces, and the like.

5. The care and the management of horses.

6. The harnessing of horses. Perhaps a lesson that has been worked out on the parts of a harness, can be described.

7. Probably some of the boys have had experience in training horses. There should be at least one chapter in the book devoted to this topic.

8. Who has the finest horses in the neighborhood? It would be a good thing to ask the owner to visit the school and to tell something about the history of his horses, the care they need, and other matters of interest. An account of such an experience would make a valuable addition to the book.

9. Has any boy or girl in the neighborhood a pet horse? Could it be brought to the school yard to be studied there? If so, have this experience described, and, if possible, illustrated with a photograph of the horse.

10. A story of some famous horse of which one of the pupils has heard or read.

In most cases the notebooks submitted in last year's competition showed great care and originality in preparation. A number of them had very attractive covers, and were well illustrated. Many valuable extracts

regarding horses had been cut from newspapers and magazines and neatly pasted in them. The following is a list of topics taken from the notebooks. It will be suggestive to schools that undertake a notebook this year.

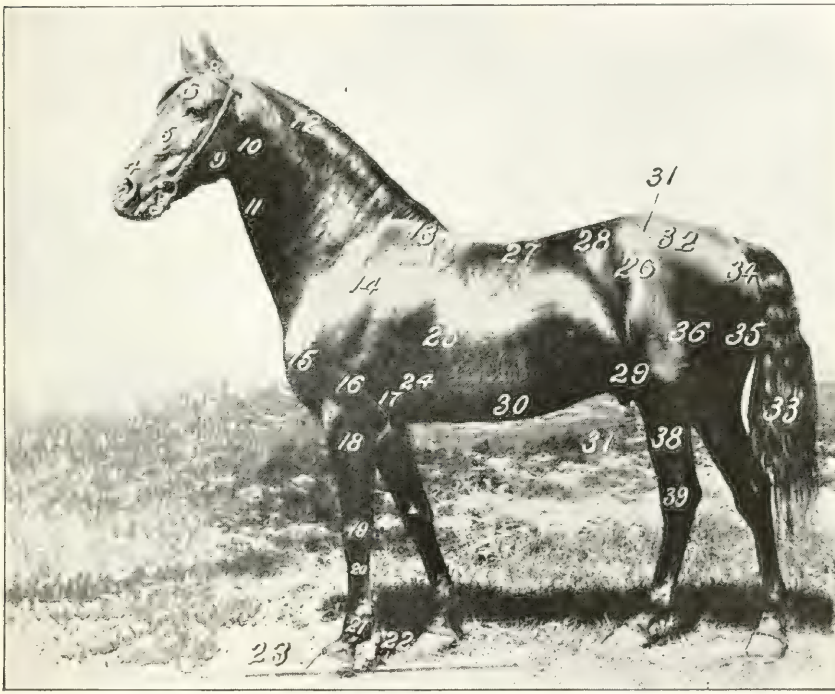
Origin and development of the horse
Early history of the horse
Countries from which the first horses came
Horses in history
The Arabs and their horses
Types of horses
Breeds of horses: their place of development and a description of each
Parts of a horse
Measuring a horse
A well-proportioned horse
Description of a United States cavalry horse
Ponies
How to buy a horse
How to tell the age of horses
Care of horses: kindness; feeding; bedding; shoeing; care of the feet; fitting a new collar; clipping; driving; backing; docked tails; overdrawn checkrein; dusty hay; a heavy load; how long a horse should work; some stable rules
Parts of the harness
Care and purpose of the harness
How to harness a horse
Description of the horseshoe
Diseases of horses
Common defects in horses
Cause of shying and how to stop it
How to cure pawing
Horse training
Breaking horses
Horses for profit
A survey of horses
Horses in New York
Horses in the local district
Talk on horses by a horseman in the district
A history of the finest horses in the district
My mule colt
Pet horse in the neighborhood
Stories about horses
Poems about horses

LESSONS ON HORSES

M. W. HARPER

I. THE PROPORTIONS OF A HORSE

Every farm boy and every girl too, for that matter, should know what characters constitute a good horse — what makes a horse wanting in form,



The parts of a horse: 1, mouth; 2, nostrils; 3, chin; 4, nose; 5, face; 6, forehead; 7, eye; 8, ear; 9, lower jaw; 10, throatlatch; 11, windpipe; 12, crest; 13, withers; 14, shoulder; 15, breast; 16, arm; 17, elbow; 18, forearm; 19, knee; 20, cannon; 21, fetlock; 22, pastern; 23, foot; 24, fore flank; 25, heart girth; 26, coupling; 27, back; 28, loin; 29, rear flank; 30, belly; 31, hip; 32, croup; 33, tail; 34, buttock; 35, quarters; 36, thigh; 37, stifle; 38, lower thigh; 39, hock

what makes it desirable. The various parts of an animal when studied in detail exhibit dimensions of length, breadth, thickness, and direction. It is in part because of these general relations, or proportions, that a horse is distinguished at first sight from a zebra. These proportions may be good or bad. If good, the animal is said to be well formed, or to have a handsome form; if bad, he is said to be wanting in form.

In a study of these relationships, or proportions, some part of the horse must be taken as a unit, or standard of measurement. The head is

most used for this purpose, because it is the most noticeable, its length is easily obtained, and variations are more rare than in other parts.

If the total length of the horse's head, from the tip of the lips to the

Students measuring a horse

top of the poll, is compared with the body of a well-formed horse, it will be found that there are four other measurements almost exactly equal to it, as follows:

1. The length of the neck, from the top of the withers to the poll. If there is much difference between these measurements, either the head is too long or the neck is too short.

2. The height of the shoulder, from the top of the withers to the point of the shoulder.

3. The thickness of the body, from the middle of the abdomen to the middle of the back.

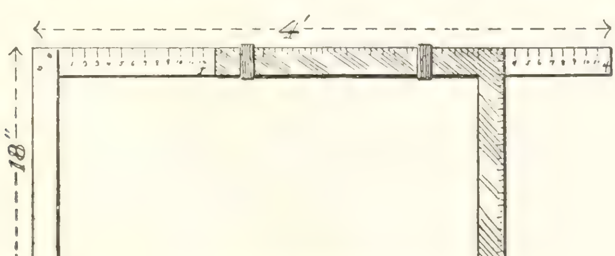
4. The width of the body, from one side to the other. If there is a great variation in these measurements, the horse has a poor form.

A horse must be in harmony with his surroundings. A light harness horse, which is attractive when hitched to a light runabout, would appear

very much out of place if hitched to a heavy draft wagon; whereas the ponderous draft horse would seem in place when hitched to such a wagon and would appear very much out of place when hitched to a light runabout. If the beauties of a well-formed and handsome horse are to be appreciated, he must be placed in surroundings in keeping with himself. In this connection, the height and the length of the horse assume some importance, as it is not an uncommon sight to see a small horse hitched to a large buggy or to see a large horse hitched to a light buggy. In either case the appearance of the horse is criticized; yet the animal may be very well-proportioned.

As has been stated there is a relation between the parts of the horse's body, that is, the length of the head is almost equal to the width and the depth of the body, as well as to the length of the shoulder and the length of the neck. There is also a relationship between the length of the head, the total length of the body, and the total height of the body. The length of the horse's body may be determined by placing the stationary end of the bar, which is described in a later paragraph, against the point of the elbow, and by sliding the square along the bar until it reaches the back of the buttock. The distance is equal to almost two and one-half times the length of the head.

There are two points from which the height is measured: first, from the highest point of the withers to the ground; and second, from the highest part of the rump to the ground. If the height is taken from the highest point of the withers, by placing the stationary end of the bar on the ground and sliding the square up the bar until it reaches the top of the withers, this distance will be equal to almost two and one-half times the length of the head. If the height of the horse is taken from the highest point of the rump to the ground, this distance will also be found to be almost two and one-half times the length of the head. There are,



Instrument for measuring horses

therefore, three measurements equal to two and one-half times the length of the head: (1) the length of the horse's body from the point of the

elbow to the buttock; (2) the height from the withers to the ground; (3) the height from the rump to the ground.

Since some of the good points of the horse are judged by proportion, the pupils may make an instrument for taking measurements, as follows: Procure a piece of soft white pine two inches wide, one-half inch thick, and four feet long. To one end of this, and at right angles to it, tack securely a similar piece of pine eighteen inches long; to the other end strap loosely an ordinary carpenter's square so that it may slide back and forth. Now mark off the long piece in inch and half-inch lengths, beginning at the inside of the stationary bar. A yardstick may be used for making the measurements of the horse, but in order to have them accurate the instrument should be made.

II. TYPES OF HORSES

By comparing horses it may be seen that there are different forms, or types. Some possess a form that enables them to draw very heavy loads, but at a slow pace. Some are so formed as to draw light loads at a very rapid pace. Between these two extremes there is a form that is intended to draw a very moderate load, but with high action and much style. These are three distinct types, and they are called draft horses, driving horses, and coach horses.

Percheron. Draft type

The draft horse has short legs, a heavy body, a short, thick neck, broad, deep chest and shoulders, strong hocks, and rather large joints and feet. With the draft type, weight is one of the most important considerations for a true draft horse must be heavy as compared with the coach horse or the driving horse. A draft horse in fair condition may weigh anywhere

from fifteen hundred to two thousand pounds or more. The greater the weight, as a rule, the more efficient the draft horse. As the draft horse draws a heavy load, he brings greater power into the collar than does

Standard bred. Driving type

a light horse. The importance of weight is emphasized by the fact that a horse can pull a heavier load with a man on his back than without the added weight.

There are several different breeds of draft horses; percherons, belgians, English shires, and clydesdales, are probably the most familiar. The percherons came from France, and at first they were gray. Now the blacks are most in favor. The belgians, usually chestnut or bay, came from Belgium. The shires, commonly bay, brown, or sorrel, came from England. The clydesdales, very similar in appearance to the shires but often smaller and more active, came from Scotland.

The driving horse has a longer and more graceful neck, a narrower chest, a longer body, and longer legs, than the draft horse. Weight is not so important in the driving type as in the draft type. Speed and

endurance seem to be the principal points sought in the roadster, or the driving horse, and less uniformity is found in this type than in the draft or the coach types. The driving horse varies widely in height, weight, and conformation. In conformation this type tends to be angular, the muscles and joints showing prominence, with the ribs more or less noticeable. There is relatively less body and more legs, and a thinner neck, with muscularity at the croup and the quarters. The standard breed, or the American trotter and pacer, is the common type used for driving. These horses are bay, black, brown, roan — in fact they are likely to be almost any color.

Hackneys. Coach type

The coach horse, or the carriage horse as it is frequently called, is intended for the special purpose of drawing coaches and other fashionable vehicles, such as are commonly seen on the streets of every city. In general appearance the coach type shows smooth, graceful lines, with a general fullness in all parts. The neck is of moderate length and gracefully arched, the shoulders are long and slope well into the back, the body is round, short on top and long below, and the legs are of good length, showing cleanness, good bone, and plenty of muscle. In this type of horse, style and action are the most important requirements. The coach type of horse should possess rather high, bold knee action of a flashy sort. The hocks should be slightly bent, or flexed, and the legs should be carried well up to the body when in action.

There are several breeds of coach horses, the hackney, the French coach, and the German coach being the best known. Of these, the hackney is perhaps the most desirable as a coach horse because of his high action and pleasing style. The hackney came from England, where for centuries he has been bred for a saddler and a roadster. In color the hackney varies; chestnuts are at present in the greatest demand. The French coach came from France. In color this type varies considerably, bays and browns being the most common. The German coach came from Germany, where these horses have been bred for centuries. In color they are usually bay, black, or brown.

One must not get the idea that all the horses he observes on the street will fall into one of these three types, for the horses that one usually sees are common horses of no particular type and are used for a great variety of purposes. These common horses have not been bred true to any type, but are oftentimes the result of crossing the various types mentioned, or are descendants of common horses. They are not so efficient for any given purpose, and are not so valuable, as when bred true to a given type.

III. CARE AND MANAGEMENT OF THE HORSE

The efficiency of the horse and the comfort with which he performs his labor will depend largely on the general care and management that he receives. It should be remembered that the horse is a very sensitive animal, and that no treatment of him can be too gentle. Jerking, striking, whipping a horse, or shouting at him are inconsiderate practices, which cause the animal to lose confidence in his master, and to become less useful and manageable.

Feeding

A horse should be fed liberally and frequently. He has a good appetite, a vigorous digestion, and responds to intelligent care. Regularity in feeding, watering, and working brings comfort to the horse and will probably result in long years of usefulness; while irregularity in these essentials is likely to lead to digestive disorders and other derangements.

While the amount of food to be given to an average horse can be estimated closely, the rations should be modified so as to meet the needs of each animal. One horse may need a little more than the regular allowance, and another horse a little less, since some horses are kept in condition less easily than are others doing the same amount of work under similar circumstances.

Order of watering and feeding.— Because of the small size of the horse's stomach, the order of supplying grain, hay, and water is of much importance. The horse should be fed and watered so frequently that he will

feel neither hunger nor thirst at any time. He should therefore be fed at least three times, and watered not less than four times — if convenient, six times — each day. He should be watered in the morning before feeding, and for the morning meal should receive approximately one-fourth of the daily allowance at least one hour before going to work. This food should be in a condition to be easily and rapidly consumed, so that it will be well digested when the animal goes to work. As he goes to work he should be watered, and after five hours of exhausting labor he should be given his midday meal, a second quarter of the daily allowance. Before being fed he should again have a drink of fresh, cool water, but care should be taken that he does not drink too rapidly nor gorge himself if he is very warm. If convenient the harness should be removed, so that the horse can eat in comfort and have a few minutes of much-needed rest. One hour should be allowed the horse in which to consume the midday meal. After watering and feeding he is ready for the second half of his day's work. When he has worked for five hours he should be given the evening meal. As he comes to the stable in the evening he should first of all be given a drink; care must be exercised as before to see that he does not drink too rapidly. He is now ready for the remainder of his daily allowance. Thus heavy feeding comes at night, when the horse has ample time to masticate and digest his food and is not obliged to go to work immediately.

Feeds for the work horse.— The feed for horses usually lacks variety. If the rations of horses in a given locality are studied, they are found to be composed of one kind, or at most two kinds, of grain and one of forage. The owner insists that this is the most practical and economical ration that he can feed with safety to his horses. In a second locality, at no great distance from the first, the list of food materials is found to be changing, and in some cases entirely changed, yet with the same claim of superiority or necessity as before. Such study shows that the range of suitable foods is very wide.

Most of the grains fed to the horse belong to the cereal group — oats, corn, barley, rye, and wheat. These grains are similar in composition. They contain a fairly low water and protein content and a considerable amount of nitrogen-free extract, fiber, and fat. They are palatable and digestible. The choice of cereal grains for feeding the horse is largely to be determined by relative cost.

No other grain is so safe for horse feed as old oats, and the animal is rarely harmed if by accident an oversupply is given. This is due to the oat hull, which causes a given weight of grain to possess considerable volume. It is said that horses fed on oats show a spirit that cannot be produced by the use of any other feedstuff.

Next to oats, corn is the common grain for horses in America. It is used largely in the Corn Belt and to the southward. While much has been said against the use of corn because it is fattening and heating unless fed in connection with some bulkier feed, it is the cheapest of all the cereal grains, considering the amount of food value per unit of weight. A given quantity furnishes more energy than does the same quantity of any other food. It furnishes the largest amount of digestible nutrients at the least cost, and is universally palatable.

Well fed and well groomed

Corn and oats, mixed half and half according to weight, make a very good grain ration for horses and are much cheaper than oats alone. The bulk of oats overcomes, in large measure, the objectionable features of corn; while corn, with its large amount of easily digested materials, furnishes the ration with the elements that supply energy.

Because of its physical effect, wheat bran is considered a valuable addition to the ration of horses. Bran has a loosening effect on the bowels and tends to allay feverish conditions. It is entirely too bulky to form any considerable part of the feed for a hard-working animal.

Among the many dry forage crops fed to horses, timothy hay heads

the list, although it is not particularly rich in digestible nutrients. There are many reasons for this popularity. Timothy forms the principal market hay; it is difficult to adulterate with other hays or weeds without detection; it is relished by horses; it is free from dust. All these characteristics commend timothy hay as a horse feed.

Grooming

The grooming of the horse deserves careful consideration. Nothing else contributes so largely as efficient grooming to the beauty and the luster of his coat. Because of this fact, the body usually receives sufficient attention, but the legs receive entirely too little. If the horse's legs are muddy when he arrives at the stable, they should be roughly cleaned with a half-worn, common broom; the horse should be placed in the stall, fed, unharnessed, groomed thoroughly, and blanketed. The legs should then be given a thorough, rapid brushing. Time spent in cleaning and rubbing the horse in the evening, after the day's work is done, is of much greater benefit to the animal than the same amount of time thus spent in the morning.

If the horse is working in mud, it is desirable that the hair be clipped from his legs; if this is done, the legs may be kept clean with much less difficulty than otherwise. In case the legs are clipped, it is all the more important that they should be thoroughly cleaned and rubbed each evening after work. The hoofs should be examined and the cleft between the sole and the frog should be cleaned. Horses cared for in this manner will pay for the extra care many times over by coming from the stable in the morning in the best of spirit and by their increased efficiency and prolonged usefulness. This will be indicated by their pleasing appearance, the snap and the vigor with which they lift their feet, and the complete absence of stiffness in their joints. These horses will remain comparatively free from the many diseases to which the legs and the feet are subject.

Bedding

Bedding should always be used liberally. A horse at hard work needs rest at night, and much more rest is to be obtained if the horse is given a good bed. The bedding should not be permitted to become foul, for this will not only lessen the comfort of the animal, but will also promote disease. Straw is the most satisfactory bedding material, but when high in price it may be replaced by other materials, such as shavings from the planing mill, rejected pieces of cornstalks, tanbark, or leaves. Old straw is preferable to new, being drier and more elastic. The more broken and bruised the straw is, the less bulk and elasticity it has; hence a greater quantity is needed.

Blanketing

In this climate the use of a blanket is indispensable. A horse will be more efficient and will endure much longer if reasonably protected against cold rains, heavy winds, and sudden changes in temperature. If the horse is warm and sweating on his arrival at the stable, he should not be blanketed until he has ceased to steam, nor should he be left in a draft. When blanketed at once there is little opportunity for him to dry, the blanket becomes damp, and the hair remains moist all night. If the blanket is not used until the animal has ceased to steam and is somewhat cool — which will be in a quarter of an hour — the hair will be dry and smooth on the following morning.

Some caretakers of horses use two stable blankets. One is placed on the animal immediately after he arrives in the stable; this is removed in a quarter of an hour and is replaced by another that remains on the animal during the night. This is perhaps advisable in very cold climates, since the animal may cool off too quickly if not given some protection on arriving at the stable.

IV. HARNESS AND HARNESSING

The work of the horse is accomplished by means of power transmitted through the harness. Properly fitted harness adds much to the efficiency and the comfort of a horse. A well-kept harness adds very materially to the general appearance of the equipment. Hence it is important to know what the various parts of the harness are and the use of each. A set of harness is really very complicated, and if the parts were unbuckled and mixed together, there are few persons who could buckle them together quickly at the first trial.

The names of the parts of a harness and the uses are given as follows: (Illustration, page 1186.)

1. Bridle — used to hold the bit in the mouth and to restrain the horse. The parts are: a, bit; b, noseband; c, chin band; d, face band; e, blinds; f, winker braces; g, brow band; h, crown band; i, gag swivel; j, side check; k, throatlatch.

2. Lines — used to control and restrain the horse.

3. Collar — used to protect the shoulder, thus enabling the horse to draw heavy loads without injuring the shoulder.

4. Hames — used to distribute weight along the collar.

5. Hame tugs — used to fasten the traces to the hames.

6. Traces — used to connect the hame tugs to the load.

7. Martingale — often used to hold the collar in place in backing a load, and sometimes attached to the lines to hold the horse's head in position.

8. Saddle — used to protect the back from the weight of the shafts, to receive the checkrein, to hold the lines and the parts of the harness in place.

9. Girth — used to hold the harness in place.

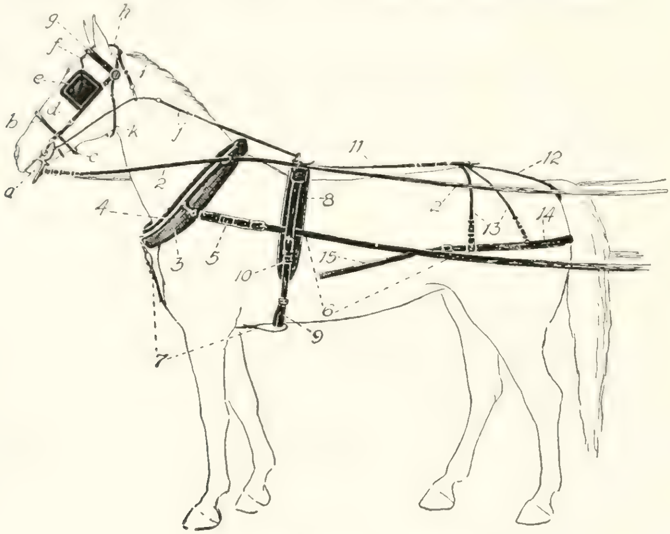
10. Shaft tug — used to hold the shafts in place.

11. Backstrap — used to hold the saddle, the hip straps, and the crupper in place.

12. Crupper — used to hold the hip straps, and in connection with the back band to hold the saddle in place.

13. Hip straps — used to hold the breeching in place.

14. Breeching — used in connection with backing the load.



Parts of a harness. See text

15. Holdback straps — used to connect the breeching with the load in order to hold back and in backing.

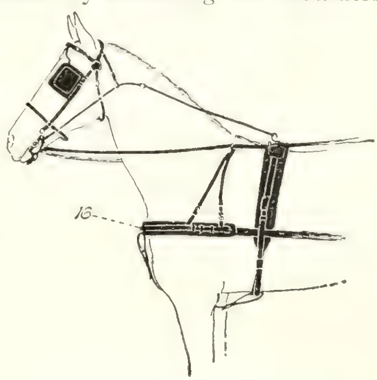
16. Breast collar — often used in place of the shoulder collar when the load is light.

Learning the various parts of the harness.— Perhaps the best way to learn the name and the location of the various parts of the harness is to unbuckle it, noting how each part is attached and where it comes from. The parts should be named as they are separated. When the harness is all apart, attempt should be made to put each part back again in its proper place.

Purpose of the harness.— Harnesses are used for two purposes: first, to enable the driver to control the horse; second, to enable the horse to

control the load, to move it forward and backward. In order to control the horse the driver must gain command of the head, and this is best accomplished by the mouth, since it is well forward and tender. That the mouth is tender and easily made sore by poorly fitting bridles must not be forgotten, for many gentle horses are rendered unsafe by spoiling the mouth with a cruel, ill-fitting bridle. Hence much care must be taken in properly adjusting the bridle.

In order to enable the horse to control the load, the driver must attach the animal to the load in such a manner as to give the horse perfect control over himself. This is best accomplished by attaching the shoulders of the horse to the load; and in order to do this, collars, hames, and traces have been devised. Since the compression between the collar and the shoulder is great, much attention must be given to these parts or the shoulders will become sore. In order to enable the horse to back the load, the breeching and the holdback have been devised.



Breast collar

In adjusting the harness it must be remembered that there are four places on the horse likely to show abrasion and to become sore. Poorly fitting bridles and severe bits cause sore mouths; poorly fitting collars cause sore shoulders; poorly fitting saddles, if there is much backing, cause sore backs; and poorly fitting cruppers cause sore tails. Sores thus produced give the horse much pain and are likely to cause viciousness. A sore mouth often provokes a horse to run away; sore shoulders and a sore back often provoke balking; and a sore tail often provokes kicking.

Choosing and fitting the bridle.—In choosing a bridle the bit is the first part to be considered. Bits of many types have been devised to meet the various and peculiar habits of the horse. For most horses a good-sized bar bit cannot be improved on. Care should be taken to see that it is the proper length to fit the animal's mouth. After the bit has been decided on, the adjustment of the bridle must be considered. Sometimes the headstall is so short as to draw the bit upward into the angles of the mouth; it thus annoys the horse and may produce a sore mouth. Again, often the headstall is too long and allows the bit to drop; in such a case the horse becomes unmindful of the driver's wish. After the adjustment of the bridle, comes the arrangement of the blinds. These should be carefully adjusted and securely held in place so that they will not flap and thus annoy the horse.

Fitting the collar.—Fitting the collar is not only of much importance, but it is also a rather difficult task. The collar is very stiff, firm, and slow to adjust itself to the shoulders. A good way to adjust the collar is as follows: Choose the most perfectly fitting collar available, wrap it round and round with a moist cloth, and let this wrapping remain overnight. In the morning put the collar on the horse and work him moderately through the day. After having been moistened in this way, the collar will adjust itself to every inequality of the shoulder, and the horse will seldom be troubled with soreness.

Fitting the crupper.—An ill-fitting crupper is a common cause of sore tail, and a horse with a sore tail is often difficult to manage. This soreness is often caused by having the backstrap too short, thus drawing the crupper up tight against the tail, which soon becomes abraded. In order to avoid this condition, the backstrap should be the proper length, in which case there will be little likelihood that it will make the tail sore.

Care of the harness.—The harness should receive proper care as this will increase its period of usefulness and also lessen the likelihood of its injuring the horse. The bearing parts should be kept scrupulously clean at all times, particularly the collar, the saddle, and the crupper. It is is not possible to prevent sore shoulders, a sore back, and a sore tail, if these parts are permitted to become dirty. Because of sweat and dandruff the body beneath these parts should be carefully cleaned immediately after the harness is removed.

Harnessing and hitching.— Properly speaking the operations of fitting the bridle, the collar, and the crupper are included under the subject of harnessing, but it is clear that once these parts are properly adjusted, the harness may be put on and taken off an indefinite number of times. Usually the term *harnessing* is used in connection with the term *hitching* to designate the operation of putting the harness on a horse and fastening the horse to a vehicle.

In all the operations of harnessing, saddling, or handling a horse, the work should be done from the left side, and the harness should be placed on the animal gently but firmly. It should never be thrown on in such a way as to annoy, frighten, or injure the animal.

No specific rules can be given for harnessing a horse. The practice will vary under different conditions. If the horse is to be harnessed before it is taken from the stall, the following method is generally used. The collar is put on and fastened; the back pad is adjusted; the crupper and the girth are fastened. Care should be taken that the latter passes through the martingale. Lastly the bridle is put on; the checkrein and the top of the bridle should be taken in the right hand, and the bit in the left hand. If the bridle is lifted up over the horse's head, and the bit brought

against the lips and the teeth and moved a little back and forth, the horse will usually open its mouth and take the bit. Sometimes a horse is stubborn about taking the bit, and in this case, if the fingers of the left hand, holding the bit, are inserted in the openings between the horse's front and back teeth and the roof of the mouth tickled, the horse will instantly open its mouth and take the bit. After the bit is inserted, the bridle should be adjusted over the horse's ears, and the throatlatch fastened. The horse can then be led from the stall. Before hitching the horse to the vehicle, the lines should be fastened to the bit, and placed where they can be easily reached. If the horse is taken from the stall and its harness put on in a shed or a barn, the bridle is usually adjusted first. After the horse is led out the collar and the back pad are put on in the order described.

In hitching a horse into a pair of shafts, the shafts should always be raised, and the animal backed under them, or the vehicle should be drawn forward, because the horse is likely to step on the shafts and break them if backed in while the shafts are on the ground. When the shafts are properly adjusted in the shaft tugs, the traces should be fastened to the vehicle; then the holdback straps should be fastened to the shafts, preferably with the trace between the straps instead of over both of them. Lastly the second girth, or the straps on the first girth that are to hold the shafts down, should be fastened. This is important because otherwise in going down hill or in backing, the shafts are likely to fly up and frighten the horse.

In unhitching the order is reversed. Care should be taken to have the horse entirely free from the vehicle before he is led away; the lines should be the last part unfastened.

In hitching a pair of horses each harness should be put on from the left side; then the horses should be fastened together by the cross lines and the neck yoke, which holds up the tongue of the wagon and is used in backing. In this case the strain of backing is placed on the collar instead of on the breeching.

Tying.—A horse should be tied by a strong rope or a strap about the neck. The strap should be passed through the ring of the bit and tied to the post. A horse should always be tied short; otherwise he may get his foot over the strap, be unable to disengage it, break the strap or the checkrein, become frightened, and cause an accident.

Editors' note.—Almost every boy and girl in the country learns to harness and drive a horse, but they are not always thoughtful to be sure each time that the harness is comfortably adjusted, and in driving they are likely to let their enthusiasm lead them into bad habits. Best results are obtained by treating a horse gently but firmly, and in the simplest and most direct way.

V. DRIVING

In driving, the manner of holding the lines is very important since it is necessary to preserve the natural sensitiveness of the horse's mouth. The lines should be held in the left hand, the left line coming into the hand over the forefinger and the right one between the middle and the ring fingers. The guiding of the horse is done with the right hand, which also carries the whip. The reins should be held so that the horse can feel the bit, but to pull on the lines more than is necessary develops a hard mouth, which makes the horse difficult to control. On the other hand, if the lines hang loosely, the horse soon becomes careless in his action. Many drivers

Team of Shetland ponies

have a habit of jerking at the lines to excite the horse to increase his speed. This is a bad practice and soon destroys the natural sensitiveness of the animal's mouth.

In working a horse few signals should be used. These should be used to mean exactly the same thing at all times. Signals or commands should be given gently, but firmly, and should always be carried out.

Whoa should always mean to stop, and nothing else; it should not mean to go slow or steadily, or even to get ready to stop.

Steady should be used when it is desired to have the horse go slowly or steadily.

Back should always mean to move backward, and should not mean to stop.

Get up should always mean to move forward in case the horse is hitched.

These four commands are sufficient for the horse at work. They should be spoken clearly and distinctly and should never be combined, as *whoa-back*, which is often used in the place of *whoa*.

VI. HORSE TRAINING

The profit and pleasure to be derived from the use of a horse depends on his being subservient to his master's will. The more complete his training, the better the horse will be. The problem is, then, so to train the horse as to bring him to his maximum usefulness.

A horse seems to have a rather limited reason, but a rather remarkable memory. These facts must be taken advantage of in training the animal. To begin with, there are two principles more or less opposite that must be remembered by the trainer; the horse must be led to underestimate certain of his powers, and at the same time be made to believe that there is no limit to certain others. For example, the first time the horse is tied by the head, he should be fastened so securely that the halter will hold in case he pulls. If the horse pulls and fails to free himself in the first few attempts there is little likelihood of his trying it later; while if he succeeds in freeing himself at first, he will never cease trying to repeat what he once accomplished. On the other hand, it is very important not to overload the horse that is being trained, with the desire to create in him the notion that he can pull anything. Thus in order to promote the horse's usefulness, the trainer should exaggerate the horse's appreciation of those powers that are useful to man and deceive him as to certain others that are not useful and are perhaps positively dangerous.

A horse should never be trusted more than is necessary. Many distressing accidents occur from this cause. A good horseman never runs risks when they can be avoided.

It may be added that not all men are fitted to train horses; in fact, not all horse lovers are good horse-trainers. There is a particular adaptation possessed by those unfamiliar, as well as by those familiar, with the horse. A man possessing this particular adaptation, although unfamiliar with the horse, will in a very short time, if given the opportunity, make a better trainer than the man who is familiar with the horse but lacking the special adaptation.

Training the colt

The colt should become familiar with man while young. In the very beginning he should be taught subordination and should not be allowed to become willful or headstrong. His future usefulness will depend much on his courage and fearlessness, and in order to promote these characteristics, the colt should become familiar with man at as early an

age as possible. If taken in time and properly handled, he need never know fear. A colt should never be frightened. Too many persons thoughtlessly try to tease the young colt by running at it or by throwing sticks at it — practices that should never be indulged if a reliable animal is to be developed. The colt should be taught useful lessons only.

Teaching the colt to lead.—The colt, or foal, should be taught very early the uses of the halter, first to lead, then to drive. But even before haltering, the colt may be taught to stand over, to have his foot raised, and to back. In handling the colt the trainer should be careful about the ears, the back of the forelegs, and the flanks, as these parts are often very sensitive. The colt should be caught by putting one hand under the neck and the other under the hams or around the buttocks; he should never be caught around the neck alone, for if this is done, he will go backward and perhaps fall. If he attempts to go forward the trainer should press back with the hand under his neck; and if he attempts to go backward, should press forward with the hand around the buttocks. Colts caught in this way will allow persons to walk up to them; whereas if they are caught around the neck, there may be difficulty in getting near them.

A strong, well-fitting halter should be chosen for the colt; it should not be a new one that smells strangely to the colt, but one that has recently been used. Care should be taken not to pull heavily on the noseband at any time; occasionally deformed face lines and imperfect necks are caused in this way. It is not necessary to drag a colt by the halter in order to teach him to follow. After such treatment, the reverse effect is usual; the harder the colt is pulled, the harder he pulls back. If, on the contrary, he is coaxed along the accustomed route, for example, to the watering trough and back, he will soon follow promptly.

Catching a foal the first time

If the colt continues to resist, however, other means must be tried. At all events the trainer should not stand in front of him and try to pull his head forward, for he will roll his eyes, shake his head, and step back. Advan-

tage must be taken of his natural tendency to step forward when pressure is brought to bear on the buttocks. A small rope, the size of a sash cord and about ten feet long, with a noose or a ring at one end, should be placed gently over his back just in front of the hips, with the noose or the ring on the underside of the body. When the other end of the rope is run through the noose, the rope can be closely drawn around the flanks, passed along under the body between the forelegs, and then up through the ring in the halter.

Loin hitch to teach a foal to lead

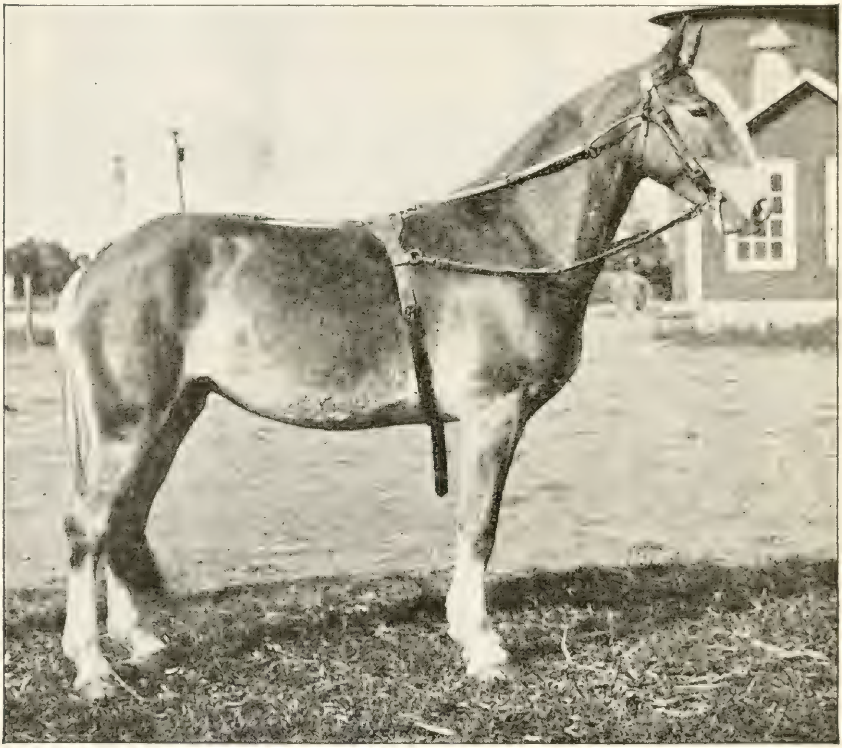
This is called the loin hitch. The trainer should pull gently on the halter strap with one hand, and, as the colt begins to shake his head, give the light rope a sharp pull with the other hand; the colt will immediately step forward. If he is given time to become used to the lesson, he will soon follow wherever he is led.

After the colt understands the uses of the halter and will lead, he may be taught to drive with reins by securing the lines to the rings of the halter. A bit should not be used on the young colt.

Training to the uses of the bit.— It is perhaps best to train the horse to the uses of the bit when he is about two years of age. The manner in which this is done will go far toward determining his usefulness. Inasmuch as the master's desire is conveyed to the mind of the horse through the medium of hands, reins, bit, and mouth, no progress can be made, and none should be attempted, until this means of communication has been established.

No other one thing contributes so much to the pleasure, the comfort, and the safety of the driver of a horse as a responsive mouth that promptly obeys the slightest instruction from the master. In general horses have good mouths naturally. A bad mouth is usually the result of improper handling, and often is the cause of many other imperfections, such as tongue lolling, crossing the jaws, hobbling, and irregular and unsteady gaits, many of which, when well established, are difficult to overcome.

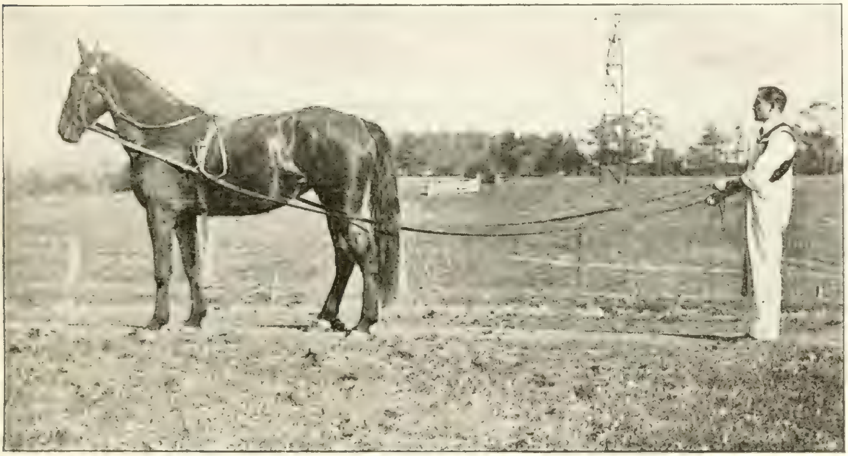
The young horse can usually be made familiar with the uses of the bit by the application of the bitting harness, or the dumb jockey as it is sometimes called. This bitting harness consists of an open bridle with large, smooth bit, a checkrein, a surcingle, a crupper, and two side lines running from the bit to buckles on each side of the surcingle. The adjustment of the bridle is important. The length of the headstall must be so adjusted as to bring the bit in mild contact with the bars of the



Bitting harness

mouth. If the headstall is too short, the bars and the corners of the mouth soon become sore, and the animal may become vicious; on the other hand, if it is too long, the bit drops down in the mouth, and the animal becomes careless. With the bitting harness properly adjusted, the colt may be turned into the familiar open paddock in order to become accustomed to having the bit in his mouth. The checkrein and the side reins should be left slack at first. Gradually from day to day the reins should be shortened, although care must be taken that they are

never made so short as to place the head in an uncomfortable position, or to tighten the bit and make the corners of the mouth sore. During a few hours each day for perhaps a week or less, the colt should be driven in the bitting harness. Real lines may then be substituted for the side reins, and the colt driven until he knows how to guide this way and that, to stop at the word *whoa*, and to step forward at the command *get up*. He should be trained to stand absolutely still while he is being harnessed



Driving with lines

or saddled, or at any time when it is desired that he should do so. A horse that is continually stepping about while being harnessed is but half-trained. The trainer should be gentle at all times, but he should accomplish everything that is undertaken.

Poling the colt.— Before being harnessed or hitched, the colt should be made familiar with the pressure caused by the harness and the shafts. In order to do this, a light pole, from eight to ten feet long, should be held for the colt to smell and to touch with his nose. The pole should be rubbed gently over the nose, the side of the face, and up to the mane and the crest. After scratching the crest the pole should be brought back to the withers, down over the shoulders, and along the outside and inside of the forelegs. The pole should then pass along the back to the hind quarters, and down along the outside and the inside of the hind legs. The process should be repeated first on one side and then on the other, and every part of the body should be touched, until the colt becomes perfectly submissive.

Harnessing the colt.— After the colt has become familiar with the bitting apparatus and has learned to obey simple commands, he may be harnessed. The harness should be of good quality and in good repair, and should

fit perfectly; if a part breaks, the colt may be ruined for all time. The collar should receive special attention, since it is through this part of the harness that the horse exerts his power, and the colt's shoulders are likely to be tender and easily abraded. The collar must be kept scrupulously clean. If the colt loses flesh, the collar, which fitted perfectly in the beginning, may become too large. A breast collar is admissible when the load is light. It must not be adjusted so high as to choke the animal, nor should it be so low as to interfere with the action of his limbs. The saddle and the crupper also need careful attention. They should fit and should be kept clean, lest they abrade the back or the tail and make the horse vicious.

Hitching single.— When the colt is desired for single use, it is often advisable to train him to go single from the first. This may be done after he has become familiar with the bit, the harness, and the use of the lines. When training the colt to go single, a training cart, substantially constructed with long shafts and with a seat so arranged that the driver can mount and dismount quickly, should be employed. The shafts should be twelve or fourteen feet long, with provision at the ends for the attachment of a strap from point to point in order to prevent the colt in rearing from throwing his front leg over the end of the shaft. At first a kicking strap attached to each shaft and passed over the rump should be used, at least until the colt is accustomed to the shafts. When the colt is first hitched, an assistant should hold him until the driver is ready, and then he should be allowed to go. As soon as he has become familiar with the vehicle, he should be taught to stand still until he is told to go.

Training the colt to walk fast.— There is no gait more valuable, more appreciated, and more practically useful in a horse than a fast, square walk. It is not difficult to train the average colt to walk fast, provided the proper methods are employed in early training. From the very beginning he should be walked as swiftly as he is able to walk, in order that he may form the habit of fast walking. He should never be allowed to mope along, or the habit will become strongly fixed.

Training vicious horses

In training or handling vicious horses, it is important to impress them firmly with the idea that the trainer has complete control over them and that they must obey. There are several ways of conveying this idea. Perhaps the most effective means is to contrive a self-punishing harness. With such a harness the vicious horse deals out his own punishment at the instant he violates his trainer's wish. While many appliances have been devised for the control of vicious horses, perhaps that invented by Mr. Rarey and used in his so-called "Rarey system" is as effective

as any. This harness consists of two short straps fitted with D-shaped rings, a surcingle, and a long rope. The straps are buckled around the front pasterns and the surcingle around the body. One end of the rope

Rarey's appliance for training vicious horses

is tied into the ring in the strap that goes around the pastern of the left, or near, front foot. The free end is then passed through a ring on the underside of the surcingle and down through the ring at the other pastern. Then the rope end is brought up and passed through a ring, tied about halfway down the right, or off, side of the surcingle. If the horse becomes unruly it is necessary only to pull on the rope, which brings his front feet up to his chest, and he comes down on his knees and his nose. A few hard falls will usually teach submission to the most incorrigible, but such a dangerous practice should be followed only as a last resort. It sometimes happens that horses permanently injure their knees or even break their necks as the result of a fall.

By the application of such methods as the one mentioned, the most vicious animals can ordinarily be brought under control. If the horse with a disposition to kick, rear, bolt, buck, or run can be taught that he is merely punishing himself, he will soon understand that he must not indulge in such practices. It should be remembered, however, that such horses are not trustworthy and should never be left to the care of persons incompetent to meet an emergency.

It is not uncommon for a horse to acquire whims or peculiar habits that may prove very annoying to the caretaker and dangerous to the horse as well. Some horses have the habit of rolling in the stall, making

it difficult to keep them presentable; some tear their blankets, which are more or less expensive to replace; some acquire the habit of lying down cow fashion, which often results in shoe boils that are considered an unsoundness; still others acquire the habit of gorging grain, thus endangering their health. If the horse is to reach his maximum efficiency, all such habits must be avoided or overcome.


The horse at work

VII. SCORE CARD FOR THE HORSE

The score card enumerates the various parts of the horse and attaches a relative value to each. There are so many points to be considered in examining a horse that a person who has not had much experience is likely to omit some of them if he does not have a list. Because of the number of points to be considered, the score card is rather long; but by giving each point a place and a value, a person is enabled to gain the desired information much more accurately, and even more quickly, than if the minor points are omitted or thrown in with the more important ones. A card on which the points are thus mixed leads to confusion.

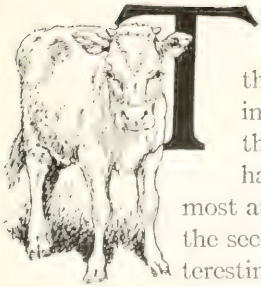
For convenience, and in order to aid in a clearer understanding, the card is divided into five parts: general appearance, which has to do with general make-up and is often the only part considered when the inexperienced person selects a horse; the head and the neck; the fore quarters; the body; and the hind quarters. Each of these parts and the points under them should be carefully noted, first collectively and then separately, for in no other way can one be sure of his choice.

SCORE CARD FOR HORSES

Scale of points	For draft		For driving	
	Perfect score	Points allowed	Perfect score	Points allowed
General appearance, 33				
Age—estimate in years by teeth	......	......	......	....
Height—estimate in hands	......	......	4	....
Weight—estimate in pounds	15	......	......	....
Form—symmetrical, smooth, stylish	4	......	6	....
Quality—skin fine, hair silky	4	......	4	....
Temperament—kind	4	......	4	....
Action—smooth, straight, regular	6	......	15	....
Head and neck, 7				
Head—lean	1	......	1	....
Muzzle—nostrils large, lips thin	1	......	1	....
Eyes—full, bright, clear	1	......	1	....
Forehead—broad, full	1	......	1	....
Ears—medium size, pointed	1	......	1	....
Neck—well muscled, crest high	2	......	2	....
Fore quarters, 23				
Shoulder—long, oblique	2	......	2	....
Arms—short, well muscled	1	......	1	....
Forearms—long, wide	2	......	2	....
Knees—clean, wide, straight, deep	5	......	5	....
Cannons—short, wide	2	......	2	....
Fetlocks—wide, straight	2	......	2	....
Pasterns—strong, sloping	3	......	3	....
Feet—medium, even size, horn dense	6	......	6	....
Body, 10				
Withers—well muscled	1	......	1	....
Chest—deep, low, large girth	2	......	2	....
Ribs—long, well sprung	2	......	2	....
Back—straight, short	2	......	2	....
Loin—wide, short, thick	2	......	2	....
Underline—straight	1	......	1	....
Hind quarters, 27				
Hips—smooth, wide apart	2	......	2	....
Croup—long, wide, muscular	2	......	2	....
Tail—attached high, well carried	1	......	1	....
Thighs—long, muscular	2	......	2	....
Lower thigh, or gaskin—long, wide	2	......	2	....
Hocks—clean, wide, straight	5	......	5	....
Cannons—short, wide	2	......	2	....
Fetlocks—wide, straight	2	......	2	....
Pasterns—long, sloping	3	......	3	....
Feet—medium, even size, horn dense	6	......	6	....
Total	100	......	100	....

COWS

THE EDITORS



THE cow is given for special study for the older pupils each year, because of its importance in the farming communities of New York State. It is interesting to know that within the past few years the total number of dairy cows in New York State has actually decreased, so that, instead of being foremost among the States in this regard, New York now has the second place and Wisconsin the first. It might be interesting to have the children seek for reasons for this change — both for the decrease in New York State, and for the increase in Wisconsin.

It is not expected that any teacher will use all of the material given in the following pages, but that a selection will be made of parts that are best adapted to the particular locality, and of most interest to the school. Many points that are mentioned in the notes on the study of horses can be used to good advantage in the study of cows, particularly those with reference to a survey of cows in the community. Many boys and girls on the farm help to take care of the cows and the young stock, and it would be of particular advantage to encourage these children to obtain information regarding the various points discussed, and to report to the school. It might also be possible to visit one or more of the farms, and on such an occasion the boy or girl living at the farm visited, would find a great deal of pleasure in acting as host.

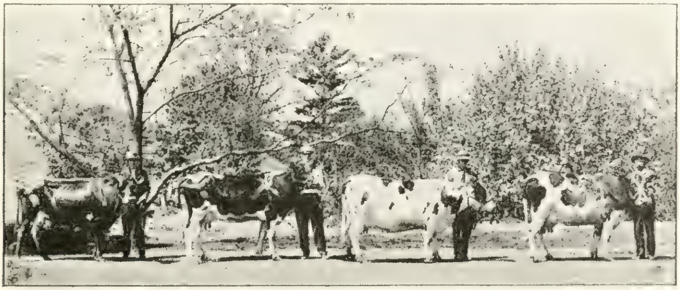
An exhibit of material related to cows and dairying might be collected at the school, such things as samples of the different feeds given to cows, dairy utensils illustrating sanitary practices, a Babcock tester, and illustrations of various kinds of cattle with short descriptions of their value and uses. The collection of such an exhibit would be of great help to the children in centering their attention on the many phases of the subject. A school exercise relating to cows could be held to which the older folk might be invited; at this time the children could explain what they have learned from preparing and studying the material collected.

Many rural schools are now using a Babcock tester. The value of this machine to the farmer is not thoroughly appreciated in some localities. Too often it is felt that the tester is of use only to the manufacturer of dairy products in determining the quality of the milk received, and the fact is overlooked that this apparatus is of great value in determining which cows in a herd are profitable, and which are unprofitable. This is determined by computing the value of the cows' feed and the value of the milk produced, based on the quantity and the percentage of butter-

fat in the milk, as determined by the Babcock test. It may often be possible for a school to borrow a Babcock tester for a few days until the pupils become familiar with the method of making the test. Aside from the practical value derived, there is considerable educational value in making the Babcock test, for it involves a little elementary chemistry and a little elementary physics. These subjects are therefore presented in a practical way. Moreover, the test teaches accuracy, carefulness, and responsibility. The two- and four-bottle open testers are not desirable to use in school because of the danger that may come from breaking a bottle while whirling the machine. The six-bottle enclosed testers are not much more expensive, and some of the schools of the State have already purchased these outfits as part of the permanent equipment of the school. Such an outfit, complete and ready to use, will cost between six and seven dollars.

The new article on the calf in this leaflet will be of particular interest, for many boys and girls in the country are given calves to raise, sometimes as a part of their home duties, and sometimes for themselves. It will be helpful to them to learn, through the article written by Professor Savage, an approved way of bringing up a calf.

There is also a new article on the scoring and judging of dairy cows, with a score card that calls attention to the various points to be considered. This lesson will quicken the interest and observation of the older boys and girls, especially if it can be given at a neighboring farm where a cow can be studied. The owner of the cow should be present, for he will be able to contribute valuable information. Point by point the items on the score card can be applied to the animal before the children, and observations made regarding them. It would add to the interest if a number of cows were scored in the same way, and, perhaps, at the same time, in order that the variations in the different animals might be brought out clearly. The score card is intended primarily to call attention to the various points in the make-up of a good dairy cow. Experience in judging animals by means of the score card is of great value when buying them.



LESSONS ON COWS

I. A STUDY OF COWS

E. S. SAVAGE

Young folks in the State of New York should be taught to love all farm animals; for cows can be loved and petted as well as dogs and horses, and a child's friendliness will be as fully appreciated by cows as by other animals.

Children in the schools can be taught to study animals at home and to report their observations at school. The teacher of a rural school should visit the homes of the children as much as possible and observe the animal life with the children. In this way parents will become more interested in the school work. In the hope of giving some suggestions to teachers, the writer has prepared the following topics and questions concerning the cow:

1. The origin of cows
    a. What two rather distinct types of cows are there?
    b. In what countries are they found?
    c. From what countries have the cows in the United States come?

2. The parts of the cow's body
    a. Where is the milk produced?
    b. What do the milk veins carry?
    c. Where are the withers?
    d. What is the wedge shape in the dairy cow?
    e. How does a cow kick as compared with a horse?

3. The teeth
    a. How many teeth has a cow? How many molars? How many incisors? On which jaw do the incisors grow?
    b. How does a cow bite?
    c. What other farm animal bites like the cow?

4. Telling the age by the teeth
    a. How many incisors has the calf when it is born? When does the calf get all its milk incisors?
    b. When does the middle pair of permanent incisors appear? the next pair? the next pair? the outside pair?

5. The digestion
    a. How many compartments has the stomach of a cow?

b. What other farm animal has the same number of compartments in its stomach?
c. How many times does the cow chew her food?
d. Which is the true stomach?
e. For what purpose are the first three stomachs?

6. Food of the cow
a. What foods are adapted to the needs of the cow?
b. Why does a cow need succulent food at all seasons of the year?
c. For convenience in studying the feeding of a cow, into what groups of nutrients is her food divided?
d. Can the body of the cow be divided into the same groups of materials?
e. What is the interrelation of these materials in the food and in the body?
f. How is a ration computed?
g. What is the nutritive ratio?

7. Breeds of cows
a. What are the four principal dairy breeds in America?
b. What are the four principal beef breeds in America?
c. In order of richness of milk, how do the dairy breeds stand?
d. In order of prominence and favor in the United States, how do the beef breeds stand?
e. What is New York, a dairy or a beef-producing State?

Answers to questions on cows

1. Prehistoric animals related to the modern cattle were domesticated by the Swiss lake dwellers. These cattle existed in rather large numbers down to historic times and were the ancestors of the domestic breeds of the present day. The two kinds of domestic cattle that exist to-day are the breeds found in Europe and America, and the humped zebu of the eastern countries of the globe. The humped zebu was domesticated in Egypt two thousand years before the Christian Era.

The cattle of the United States have come chiefly from England, Scotland, the Channel Islands (the islands of Jersey and Guernsey in the English Channel), and Holland. The beef breeds and all the dairy breeds, except the Holstein-Friesian, originated in England, Scotland, and the Channel Islands. The Holstein-Friesian cattle came from Holland. The man who may be called the father of all modern breeding and improvement of cattle was Robert Bakewell, who lived in England from 1725 to 1795.

2. The parts of the cow are shown in the illustration on this page and require no further explanation. The udder and the milk veins make up the mammary organs of the cow. The milk veins do not carry milk; they drain the blood from the udder. The fresh blood from which the milk is manufactured is supplied to the udder from the heart through arteries and is drained away through the milk veins. The larger the milk veins, the larger the probable amount of blood flowing through the udder and the larger the milk production of the cow.

The parts of a cow: a, muzzle; b, eye; c, forehead; d, ear; e, horn; f, neck; g, withers; h, shoulder; i, hip; j, rump; k, thurl; l, thigh; m, leg; n, chest; o, abdomen; p, back; q, loin; r, udder; s, teats; t, milk vein; u, switch

The wedge shape of the dairy cow is explained in the article in this leaflet on " The Beef Type and the Dairy Type," by H. H. Wing, page 1219.

The body of the cow is so made up that she can reach much farther forward when she kicks than can the horse. This enables her to protect her udder to a greater extent. A horse usually kicks with both feet to protect himself.

3. A cow has thirty-two permanent teeth: twenty-four molars — twelve on each side, six above and six below — and eight incisors. The incisors are all on the lower jaw. The place of the incisors on the upper jaw is taken by a hard pad of cartilage against which the lower, chisel-like teeth strike when the animal crops the herbage in the pasture. The arrangement of the teeth of the sheep is the same as that of the cow.

4. A calf, when born, has two pairs of incisors. The other two pairs appear during the first month. When a calf is 18 months old, he loses the middle pair of milk incisors and grows a permanent pair. The next pair, one on each side, is replaced at 27 months of age, the third pair at 36 months, and the fourth, or outside, pair at 45 months. The time of the appearance of these incisors varies within rather narrow limits, so that the age of young cattle can be told fairly accurately. A calf has also a temporary set of molars, which are later replaced with permanent ones; but they are not considered in estimating the age of the animal.

Age of cattle told by permanent incisors. The middle pair, marked 1, appears at eighteen months of age; the pair marked 2 appears at twenty-seven months; the pair marked 3 at thirty-six months; the outer pair, marked 4, appears at forty-five months

5. The stomach of the cow and of the sheep has four compartments. The first three help in the storage and the mechanical manipulation of the food. The fourth is the true stomach of these animals, in which that part of the digestion takes place that is ordinarily thought of as taking place in a stomach.

A cow chews most of her food twice. The first compartment of her stomach is large and enables her to eat a large amount of food without stopping to masticate it thoroughly. This food is stored temporarily in the first compartment of her stomach. Later, at leisure, she can lie in the shade and re-chew all her food. After the second chewing, the food is swallowed and passes along to the true stomach and on into the intestines in the regular course of digestion. This subject is fully treated under "Rumination in Cattle," page 1206.

6. The questions regarding the food of cows are all answered in the article on "Food and Care of Cows," page 1209.

7. The breeds of cows are mentioned in some detail in the article in this leaflet on "The Colors of Cows" (page 1221). In order of richness of milk, the dairy breeds rank as follows: Guernsey, Jersey, Ayrshire, and Holstein. The milk of the Guernsey and the Jersey contains from 5 per cent to 6 per cent of butter-fat. The products of the Guernsey are golden yellow; the products of the Jersey a somewhat lighter yellow, or cream color. The milk of the Ayrshire will average about 4 per cent of butter-fat, while the Holstein gives milk testing on the average about 3.5 per cent butter-fat.

The Shorthorn probably is held in higher favor in the United States than the other beef breeds, with the Hereford second; the Aberdeen-Angus stands third, and the Galloway fourth.

New York is primarily a dairy State. Very little beef is raised in this State except, perhaps, in the western part. Most of the beef consumed is imported into the State from the great western markets.

In order to make the study of the cow successful, the teacher should use every opportunity to become acquainted with the details of dairy work. There are excellent opportunities to use dairy problems in the arithmetic and bookkeeping classes. Children who become interested in the business side of dairy farming will be a help and an inspiration to their parents and will interest the parents in the school so that they will co-operate with the boys and girls and the teacher.

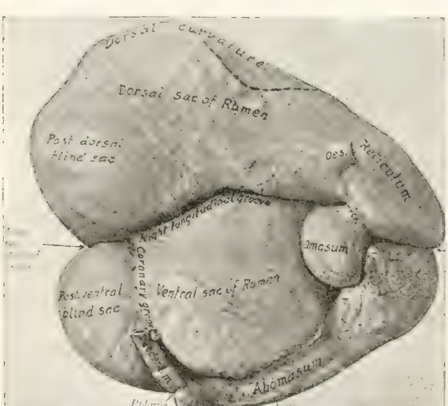
II. RUMINATION IN CATTLE[3]

E. SUNDERVILLE

(New York State Veterinary College)

Editors' note.— Since inquiries have been made from time to time on rumination in cattle, and many teachers have asked for information that will enable them to give intelligent answers to the questions asked on this subject by boys and girls, the following lesson is included.

Many boys and girls on the farm have at some time watched the cow eating, and, afterward, have watched her while she drowsily chewed her cud. They have wondered what the process was.



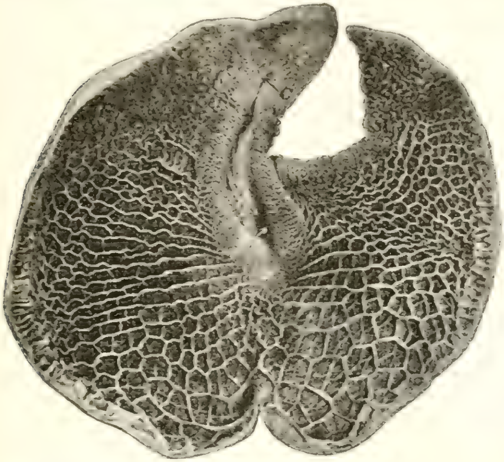
Stomach of ruminant showing the four parts

The cow, the sheep, and the goat have a much more complex system of chewing and digesting food than have other domestic animals, and, for that reason, they are classed in one great group known as *ruminants*. This name is given to these animals because they ruminate, or chew the cud. Another characteristic of ruminants is that they have no front teeth on the upper jaw, but, instead, a thick tough cushion called the dental pad.

Ruminants, while feeding at the manger or grazing, take their food

[3] Illustrations taken from Sisson's *Anatomy*.

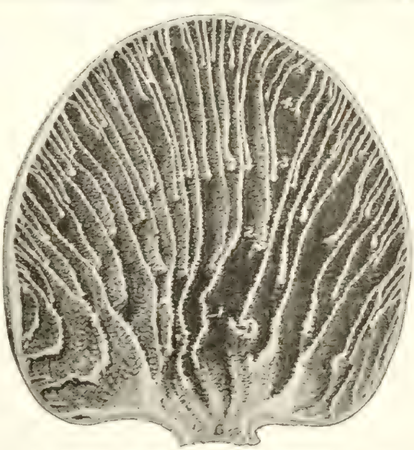
rapidly, chew, or masticate, it but little, and swallow it. Later the food is returned to the mouth for a more complete mastication.



Mucous lining of the reticulum, or second compartment. Arrow in the esophageal groove

The stomach of a ruminant is larger in proportion to the size of the animal than that of other animals. In the average-sized cow, it will hold from thirty to forty gallons. It is divided into four parts, or cavities, called: rumen, paunch, or first compartment; reticulum, honeycomb, or second compartment; omasum, psalterium, manyplies, or third compartment; and abomasum, reed, rennet, or fourth compartment.

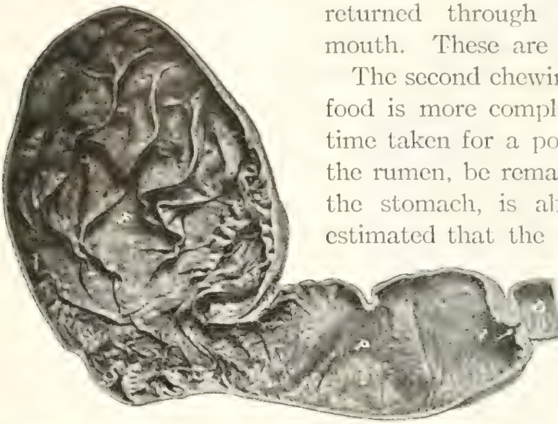
All food taken into the mouth is passed through the esophagus, or food pipe, to the stomach. This tube, with walls of muscle, reaches from the mouth to the stomach and is about one inch in diameter when normal, but it is capable of being enlarged to accommodate masses of food. The outer walls of the esophagus are made up of two sets of circular muscle fibers. One set forces the food toward the stomach, and the other forces it from the stomach to the mouth. The esophagus enters the rumen, or the first compartment of the stomach, and is continued to the abomasum by a muscular canal called the esophageal groove. This groove is so arranged that it enters the second and the third compartments of the stomach.



Mucous membrane and leaves of the omasum, or third compartment

All solid food, when first swallowed, passes down the esophagus and enters the rumen, which is the largest of the four parts of the stomach and acts as a storehouse for all the solid food. The inside of the rumen is incompletely divided into four parts by four muscular pillars. The inner lining, or mucous membrane, is covered with little pointed

fingerlike processes called papillæ. After the animal has finished eating, the food in the rumen is divided into parts large enough to be returned through the esophagus to the mouth. These are the cuds.



Mucous membrane of the abomasum, or fourth compartment

The second chewing, or mastication, of the food is more complete than the first. The time taken for a portion of the food to leave the rumen, be remasticated, and returned to the stomach, is about one minute. It is estimated that the cow spends seven hours a day ruminating the food. One of the first signs of sickness in a cow is the absence of rumination.

After the second mastication of the food, and when it is well mixed with the saliva, or mouth fluid, it is again swallowed and instead of passing to the rumen, it enters the esophageal groove. In going through this muscular canal, the fluid part passes to the reticulum and the solid part to the omasum.

The reticulum is the smallest of the four compartments of the stomach. It opens through the esophageal groove into both the rumen and the omasum. The inner lining of the reticulum is arranged like the cells of a honeycomb. Each cell is about one-half an inch across and has from four to six sides. It is in the cells of the reticular part of the stomach that foreign bodies, such as small stones, nails, pieces of wire, and the like, are deposited. Occasionally sharp-pointed foreign bodies work their way through the wall of the reticulum, and, on account of the nearness of the reticulum to the heart, enter the heart and cause the death of the animal.

The omasum, or third compartment, receives the solid parts of the food after the second mastication. The inner mucous layer of the omasum is made up of about one hundred leaves, varying in width from one to ten inches. They are arranged as follows: a large leaf is followed by one of the smallest; then comes a medium-sized leaf followed again by one of the smallest; then comes a large leaf again; and so on. Both sides of the leaves are covered with small rounded projections about the size of a millet seed. This gives to each leaf the appearance of a piece of sandpaper. It is between these leaves that the food receives its final grinding, before it is passed into the true digestive part of the stomach.

When the food has been divided into very small particles, it is passed

into the abomasum. It is in this compartment that the food is mixed with the gastric juice for stomach digestion. The inner mucous membrane of the abomasum is soft and velvety and is arranged in spiral folds about one and one-half inches wide. On the folds are found the cells that secrete the gastric juice, and by the aid of these folds, the food is thoroughly mixed with the digestive fluid.

From the abomasum the digested food passes to the intestine. The remainder of the digestive process in ruminants is similar to that of other animals.

III. FOOD AND CARE OF COWS

E. S. Savage

All cows deserve better treatment than they receive, for they supply milk, butter, and cream while they live, and even after they die their skins are made into shoes and robes and coats to keep mankind warm. Beef, the meat that they yield, is an important article of food.

Feed.—Coarse feeds are adapted to the requirements of the cow, and she can consume large quantities of hay, cornstalks, and the like. Under modern conditions, when cows are yielding large quantities of milk, a large amount of grain also is fed. The grain is made up of ground cereals or of ground by-products from the manufacture of certain human foods.

Succulent foods are peculiarly adapted to the needs of the dairy cow. The best food is, of course, green pasture grass, the natural food of the cow. At all times of the year when pasture is not available, some succulent food, such as corn silage or roots, should be given. The cow will respond in every way to special care, such as providing a variety in her ration. with some succulent food when possible.

For convenience in studying in detail the feeding of a cow, her food is divided into five groups of compounds: water, ash, protein, carbohydrates, and fat. Her food is almost entirely of vegetable origin, and the plants or the products of plants that she eats are made up entirely of these groups of materials. The *water* in the plant is the same as any pure water. It serves the plant in two important ways: by filling out the cells and thus helping in the support of the plant; and by transporting the food from the roots, or from wherever it is made, to those cells that need food. The *ash* of the plant is the mineral matter. The *protein* is the nitrogenous part of the plant tissue. The *carbohydrates* include the sugars, the starches, and like materials. The *fat* is the oil of the plant. All agricultural books use these terms; therefore the teacher should help the children to become familiar with them.

It is not easy to give common examples of the ash or of the protein of plants. These groups are intimately associated with the life of the plant and are present in all parts of it.

The plant may use any one or all three of the groups, protein, carbohydrates, and fat, as a form in which to store reserve food. Mainly, however, reserve food is stored in the form of carbohydrates, of which starch is the most common example.

The body of a cow is built up from the food that she eats. It is composed of the elements that also make up the plant body. These elements form numerous compounds, which may be grouped into the same five groups into which the plant body, or the food of the cow, was separated: water, ash, protein, carbohydrates, and fat. The chemical formula for an animal fat may not be the same as for the particular vegetable fat that was in the animal's food; this will hold true also for proteins and carbohydrates. In the animal body there are few compounds that are carbohydrate in nature. The plant, as already noted, stores its surplus food mainly as carbohydrate, with some protein and fat. The animal, on the other hand, stores its excess food material as fat. The proportion of protein in the animal body as a whole is large because the lean meat of the muscle tissue is nearly pure protein. A good example of animal protein is the albumen of an egg; another is the casein, or curd, of milk. There is no common animal carbohydrate. Lard and tallow are common forms of animal fat.

What data there are show that in order to form the protein of the body the animal must have protein in the food Any excess of protein in the food that is not needed to form body protein will be broken up. A part of the protein carrying the nitrogen will be excreted, and the remainder will be used as carbohydrate material. The protein of the body can have no source except in the protein of the food. The carbohydrate material in the body can have as its source, protein, carbohydrates, or fat in the food. The fat in the body may be manufactured from the protein, carbohydrates, or fat. Therefore, to summarize, there must be a sufficient amount of protein in the food in order to keep up the necessary protein of the body, but the fat or carbohydrates of the body may be derived from any one of the groups — protein, carbohydrates, or fat — in the food.

The animal uses the water that it drinks and that it derives from its food to keep up the supply in the body, much in the same way that the plant uses water to help support the body by keeping the cells distended, and as a transportation agent. The ash (mineral matter) taken into the body forms the bones and furnishes the mineral matter that is present in all the tissues. The protein makes up the muscle tissues of the body and any nitrogenous matter in the other tissues. The carbohydrates are used to furnish the energy for the muscles. Any excess of carbohydrates may be transformed into fat and stored as reserve material. Fats in the

body are used to give energy to the cells, or they may be stored as body fat.

A cow or other animal has three uses for the food that it takes into its body: (1) to furnish energy for the mechanical work of the body; (2) to repair any loss of material in the make-up of the body itself; (3) to store as fat any food material in excess of these needs. Fat, carbohydrates, and excess protein over the protein requirements of the body, are used for energy and fat production. Some protein and ash are used for the repair work and for the new material added to the body in the case of the growing animal.

A ration is the amount of food that is fed to an animal in twenty-four hours for the needs stated. The needs as to digestible protein, digestible carbohydrates, and digestible fat for animals have been carefully calculated. Estimating the amount of food to meet these needs is called computing a balanced ration.

It has been found that there is a certain relation between the necessary amount of protein and of carbohydrates and fat in a ration. This relation has been called the nutritive ratio. The ratio is expressed between one pound of digestible protein and the necessary number of pounds of digestible carbohydrates and digestible fat. When the first term of the ratio is expressed as one, the second term is found by multiplying the fat by $2\frac{1}{4}$, adding to it the carbohydrates, and dividing this amount by the protein. The digestible fat is multiplied by $2\frac{1}{4}$ because fat is considered to yield to the body $2\frac{1}{4}$ times as much energy as carbohydrates.

For dairy cows, it has been found that a nutritive ratio between 1:4.5 and 1:6 seems to give the best results in milk flow.

In order to compute a ration for a dairy cow weighing about one thousand pounds, suitable food should be furnished in sufficient quantity to yield about twenty-four pounds of dry matter, in which the relation of the protein to the carbohydrates plus $2\frac{1}{4}$ times the fat is between 1:4.5 and 1:6.

Care.—In addition to her food a good cow is entitled to six things from her master: (1) kindness; (2) a clean, dry home; (3) plenty of light; (4) pure air; (5) pure water; and (6) an abundance of salt. Every caretaker of cows should see that these things are supplied, as well as that his cows have plenty to eat.

Every animal in a well-managed dairy herd will be so tame that the owner and attendants can easily catch her in the open lot at any time. A dog, be he ever so gentle, is of little use in connection with a dairy herd. A club or a whip should have no place in a dairy barn.

All the light and the pure air possible must be supplied. It is not costly to provide light in a stable, neither is it very costly to provide efficient

means of ventilation in old stables if the owner is a wide-awake manager with his mind open to the best in his power for the comfort of his animals. All the dairy papers and the experiment stations are ready at any time to help and to suggest means of bettering stable conditions, with plans that may be had for the asking. Most of these plans are simple and economical, and farmers are fully capable of putting them into execution.

Cows should be watered at least twice a day. The water should be pure, and, if possible, it should be free from ice at all times of the year. If cows have a place to drink where ice does not form, and if they are watered twice a day, it does not seem necessary to warm the water artificially. It is important to avoid chilling the animal so that she will not shiver after drinking. Any system is a good watering-system that will furnish pure water and that works so that the cow gets all that she requires at least twice in twenty-four hours.

A cow should be furnished with about one ounce of salt every day. The practice of the best dairymen varies. The writer would suggest feeding each cow about two ounces of salt three times a week, either mixing it in the grain feed or merely throwing it into the manger any time during the day.

If boys and girls, in helping their fathers to take care of the cows, will keep in mind the foregoing suggestions, New York State will have some of the finest, cleanest, and tamest cows in the world.

IV. THE CALF

E. S. Savage

The proper feeding and care of calves are fully as important as the feeding and the care of the older cattle, for poorly nourished and neglected calves cannot become well-developed cattle. No one knows just how far-reaching may be the consequences of the treatment given young cattle in the first twelve or fifteen months of their lives, what the effect of stunting may be even though they are properly fed afterwards, or what the effect of ideal treatment may be on high production during the mature years. The little evidence there is shows that the calves must not be neglected.

There is great satisfaction in having a bunch of sleek, healthy calves. The proper management and feeding of calves may often be the source of self-satisfaction and self-respect to farm boys and girls because on many small farms this work is left to the children, particularly to the boys. This is as it should be. All boys should have chores to do, and the feeding of calves may well form part of their home duties. It brings a boy in contact with animals, and if he is furnished with the proper feeds for them

he will take great pains with his work, and will gain much satisfaction in watching the growth and well-being of his charges.

Feeding the calf

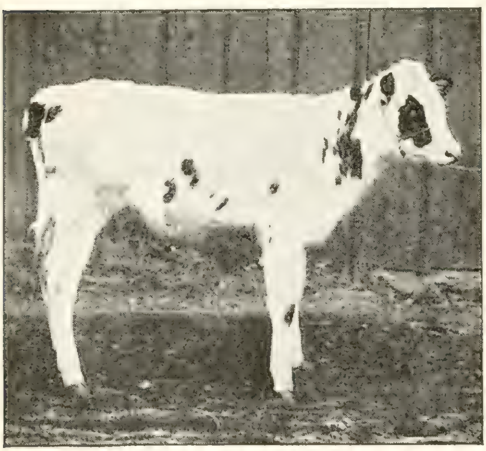
The first two weeks.— After the calf is born it should be left with the mother for two or three days, perhaps until the eighth milking. The writer has always considered the milk of the eighth milking good to save for home or market purposes. That of the first six or seven milkings is called *colostrum*, and is necessary to the health of the calf because it is laxative and has a good effect on the digestive system. The best way for the calf to obtain the colostrum is by suckling the mother, and this method is best for the mother also. If the calf does not attempt to suckle by the time it is three or four hours old, it should be helped up and assisted in getting the first meal.

After the seventh milking the calf should be taught to drink. This may be done in the following way. Use a small pail into which the calf can easily get its head. Put about two quarts of warm, fresh milk into the pail, back the calf into a corner of the pen, and straddle his neck. Grip the pail with the left hand, and with the right hand hold the calf's nose down in the milk. The first two fingers should partly enter the calf's mouth and should be slightly apart so that the milk will be drawn in between them. Gradually withdraw the fingers. After a few attempts, and as soon as it gets a good taste of the milk, the calf will usually drink properly. Whole milk should be given for at least ten days. If at all practicable it is best to feed the calf three times a day, one quart at a meal, for the first ten days. After the tenth day, if the calf is strong, it may be fed twice a day and should receive two quarts (four pounds) at a meal. The temperature of the milk should be between 90° and 100° Fahrenheit. A thermometer should always be used to take the temperature of the milk so that it is sure to be the proper temperature when fed; and one can be bought for twenty-five cents. This is one of the most important points to practice in feeding. Beginning with the eleventh to the fourteenth day the calf may be fed skimmed milk.

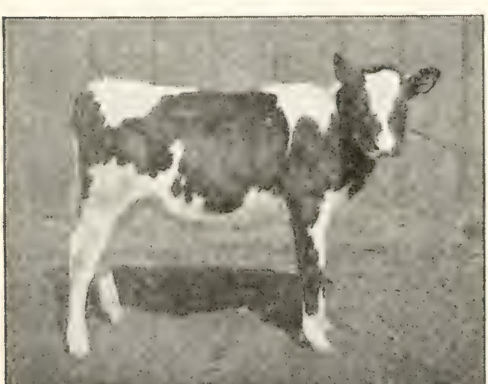
The third week.— The change from whole milk to skimmed milk should extend over a full week and should be at the rate of one pound per day. The skimmed milk must be sweet, free from foam, and at a temperature of from 90° to 100° Fahrenheit.

The fourth week and thereafter.— After the third week the calf may have more milk as its appetite and condition demand it, but it should not be overfed. There is much more danger from overfeeding than from underfeeding. Into each feeding of skimmed milk should be mixed a teaspoonful of blood flour, which is ground dried blood and a by-product

Calf raised on skimmed milk



Calf raised on meal A



Calf raised on meal B

from the large abattoirs. It may be obtained from the feed dealer. It must be very finely ground because coarsely ground dried blood will not stay suspended in the milk while the calf is drinking, but will settle and be lost. Blood flour is expensive, but the amount fed is very small and is worth many times its cost for two reasons. First, it is a very good high protein food in itself; second, it keeps the bowels of the calf in good condition and overcomes any tendency to digestive troubles.

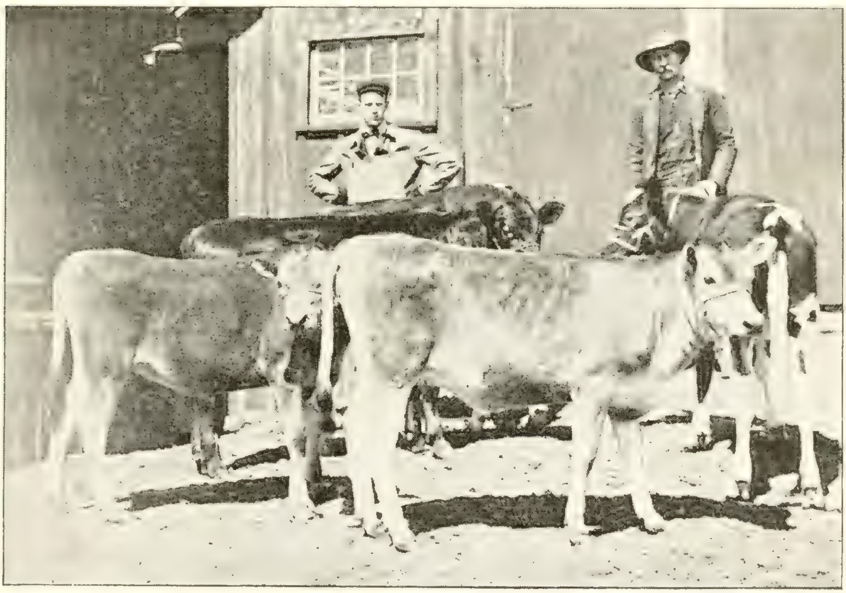
Roughage.— At four weeks of age the calf will begin to eat food other than milk. The best roughage is bright, well-cured alfalfa hay from the second or the third cutting. On farms where alfalfa hay is not available, the second cutting of clover hay may be substituted for the alfalfa. With a little care practically every farmer in the State of New York can cut and store a small amount of clover hay from the second cutting for his calves. If neither of these two kinds of hay is available, the best quality of hay that can be secured, should be used. The calf should have all the hay it will eat. After it is six months old, it may have a little silage.

The grain mixture.— At about the time at which the calf will begin to eat a

wisp of hay, it will eat dry grain. A very good mixture is the following:

30 pounds wheat bran
30 pounds ground oats
30 pounds corn meal
10 pounds oil meal

This mixture should be placed in a box nailed to the side of the pen. A calf should never be fed dry grain in the pail from which it takes milk, and



Group of calves raised on skimmed milk, hay, and grain

the grain should never be mixed with the milk. When the calf is three or four weeks old, and after it has finished drinking milk, some of the grain mixture should be put into its mouth. At the same time some of the grain should be left in the feed box. The calf will soon learn to like grain, will find the box, and will eat it regularly. A calf should be fed all the grain it will eat up clean after having its milk. Some persons keep grain before their calves all the time.

Raising calves when little milk is available

Substitutes for skimmed milk.— On many farms all the milk is sent to market in the raw state. Raising calves on such farms is much more

difficult than it is on farms where skimmed milk is available. The best advice that can be offered in such a case is to purchase a calf food from a feed dealer and feed it exactly in accordance with the directions that are supplied by the manufacturer. Two such commercial foods have been found fairly satisfactory in work with the Cornell University herd; these are designated in the accompanying table as A and B. The table shows the results obtained from these two foods as compared with the results from skimmed milk.

Number of calves	Average weight at birth (pounds)	Average weight at 5 months of age (pounds)	Average gain in 5 months (pounds)	Average gain in 1 day (pounds)	Food used
7	73	302	229	1.53	Skimmed milk
4	64	227	163	1.10	Calf meal A
4	72	202	130	.87	Calf meal B

This table shows that a good calf should weigh from two hundred and fifty to three hundred pounds when five months old, and that it should gain at least one pound every day from birth. Calves should be weighed once a week to see whether they are growing as well as they should. It is probably impossible to grow as good calves on prepared foods as on skimmed milk, but very good calves may be grown, as the accompanying illustrations show. Success will be attained only with proper care, especially to details.

Care and management other than feeding

In addition to feeding, there are some other things in the care of calves that should be mentioned. More than all else cleanliness and dryness of the animal and its surroundings are important. Even though the temperature of the stable is rather low, the calves will grow and thrive if they are kept dry and clean, and are well fed. The pens should be cleaned often and should be kept well bedded. In warm weather particularly, the calves should have access at all times to clean water.

Many farmers turn their calves out to pasture when young. In New York State it is good practice to keep all calves born after February 1 in the barn during the summer. These young calves may be turned out to night pasture if it is available. They are too young, however, to

pick their own living without some extra food; therefore it seems best to feed them in the barn during the first summer. Moreover, in the day pasture, flies plague them so that they do not grow well.

Dehorning calves.— In herds where it is desirable that all the animals be dehorned, the best time to dehorn calves is before they are three weeks old. This may be done by rubbing the little nubs of horns with a stick of caustic potash, which may be purchased at any drug store. When using it, precaution should be taken that it does not come in contact with the hands; for this reason the end of the stick that is held in the hand, should be wrapped in paper.

The hair should be clipped away from the button of the horn. The end of the stick of caustic potash should be dipped in water and the horn rubbed hard with it until the skin all around the button is raw and bleeds a little. This is necessary in order to wholly destroy the horn tissue. Care should be used that the caustic liquid does not run down into the eyes of the calf.

This seems like cruel practice, but in reality it is most humane because it does not hurt the calf very much. Dehorning a mature animal is very painful and more or less dangerous. Cattle that have been dehorned are more docile, cannot injure each other or the attendant, and are probably more productive. The sores made by dehorning calves with caustic potash will quickly heal and need no attention. The thing of greatest importance is to do a thorough job, making sure that the horn button is absolutely destroyed. If only a part is destroyed, a stubby, misshapen horn will grow, and a poorly shaped head will result.

Competition in raising calves

A competition in raising calves is a good home project. The children should be encouraged in such an undertaking, and perhaps several in the school will carry on the work at the same time. Much interest could be stimulated by keeping, at the school, a table of gains made by the calves. The conditions under which the calves are raised will vary somewhat on the different farms, particularly in the matter of the available foods especially as the animals grow older. It will be valuable to discuss these matters in the school for a few minutes from time to time in order that all may have the benefit of the experience that each child raising a calf gains from this actual piece of work. At the close of the competition a show of the calves raised could be held at the school, and an interesting half day could be spent with profit to all. Some of the older folk could be invited in and the results of the work explained to them. A well-raised calf is the result of well-directed effort, which if done in connection with the school life gains dignity and importance in the mind of the child.

V. THE DISTRIBUTION OF COWS

E. S. SAVAGE

The cattle-bearing sections of the United States.— There are in the United States about fifteen million cows, both beef and dairy. The question naturally arises, in what States are they found? There are some cows in every State; but there are six States in the Union that deserve the title "The Six Great Dairy States," and five States that deserve the title "The Five Great Beef States." The great agricultural State of Iowa is found in both these lists; therefore is has the title "The Greatest Stock-Growing State." Texas, also, is found in both lists, but it does not stand so high as Iowa because of the vastness of its area.

Based on number of cows, Wisconsin is the greatest dairy State in the Union, with 1,626,000 cows, according to the figures given in the Yearbook of the United States Department of Agriculture for 1914, New York has 1,509,000; Iowa, 1,377,000; Minnesota, 1,186,000; Texas, 1,086,000; and Illinois, 1,007,000. No other State has a million dairy cows.

In numbers of beef cows, Texas outranks the others by far, having 2,469,321 head. It must be remembered that the area of Texas is vast. Nebraska has 705,191 beef cows; Iowa, 614,930; Kansas, 558,153; and Montana, 372,798. No other State in the Union has more than 200,000 beef cows. Thus it is seen that, in this country, cattle are raised in largest numbers in the northern tier of States and in the Mississippi Valley.

Elgin, Illinois, is the greatest butter market in the United States, and the Elgin Board of Trade governs the price of butter in the Middle West. New York City is the greatest milk-consuming city in the United States. Chicago is the greatest market for beef cattle. Other great beef markets are Kansas City, St. Louis, and St. Joseph. Buffalo has a large beef-cattle market. Of course all the larger cities are great markets for raw milk and for beef in retail form.

VI. THE BEEF TYPE AND THE DAIRY TYPE

H. H. WING

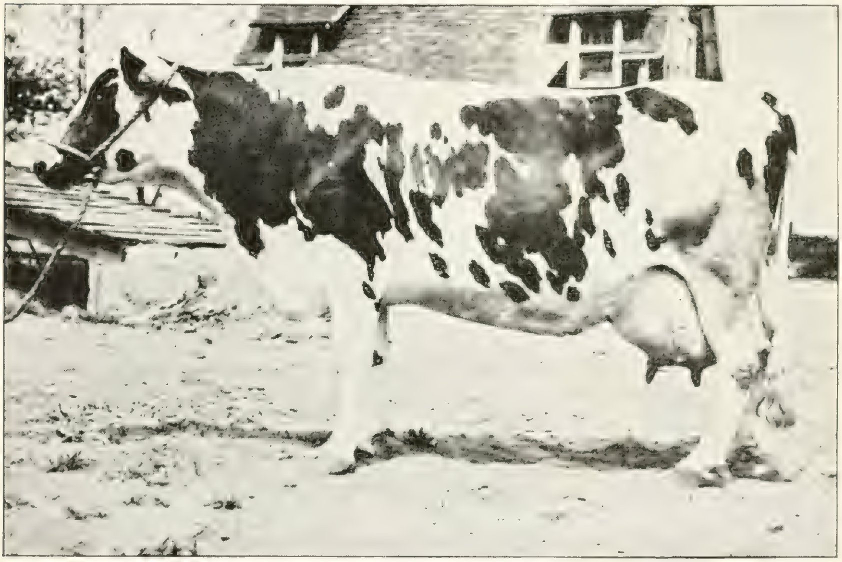
Cattle are kept for two main purposes: for the production of milk and for the production of beef. These two purposes make quite different demands on the vital energies of the animal. For this reason, by

Hereford. Beef type

selection through many generations of those animals, on the one hand, that are best developed for meat production, and of those, on the other hand, that give the largest amount of milk, there have arisen two types more or less distinct in form and in certain other characters, one known as the beef form, or type, and the other known as the milk form, or type.

It must not be supposed that these two types are entirely distinct or separate, for the cows of the beef type always give some milk, and animals of the dairy type will furnish beef of reasonably good quality when properly fattened. Then, too, while the types may be readily recognized in the best-developed individuals of either, there are a great many animals of intermediate form that would be difficult to assign to either type, since the two types tend to merge into each other by very slight gradations.

The chief differences in form that distinguish the beef and the dairy types are:



Holstein-Friesian. Dairy type

1. Outline of body, especially as viewed from the side.
2. Depth and smoothness of flesh.
3. Size of udder and external blood vessels connected therewith.

In the beef form, the outline of the body approaches the rectangular. The general direction of the top and bottom lines is straight and parallel, and the general dimensions of the body approximate those of a brick; that is, length twice the depth, and depth twice the thickness.

In the dairy type the general outline of the body is "wedge-shaped from before backward"; that is, the general direction of the top and bottom lines diverges from the front toward the rear. This is brought about by a relatively large development of the hind quarters and some-

times by relatively low and thin shoulders. The height of the animal at the hips is from one-half to one and one-half inches greater than at the shoulders. The wedge-shaped appearance is increased by a large, pendulous abdomen and by a large, well-developed udder.

In the best beef animal, even when not fully fattened, the whole body is thickly and smoothly covered with flesh (muscle) so that the angles of the bones are nowhere prominent. This is seen particularly over the upper part of the ribs immediately back of the shoulder, on the loins, in the thighs, and on the shoulder. The neck is short and blends smoothly into the shoulder, and the whole body has a rounded appearance.

In the dairy animal, the lack of muscular development gives rise to a spare angular appearance. The angles and joints of the bones are prominent, particularly in the pelvis and the spinous processes. This does not mean that the animal is poor or emaciated, for there may be abundant fat, as indicated by a soft, pliable skin, and by rolls of fat in the fold of the skin in the flanks; yet the animal may present a spare appearance.

In the dairy type, the udder is, of course, much larger and fuller than in the beef type, and the so-called " milk veins " stand out prominently on the abdomen, extending well forward to the chest. In the beef type, not only is the udder small and comparatively insignificant, but the exterior veins leading from it are small and more or less embedded in the surrounding muscular and fatty tissue.

VII. THE COLORS OF COWS

E. S. SAVAGE

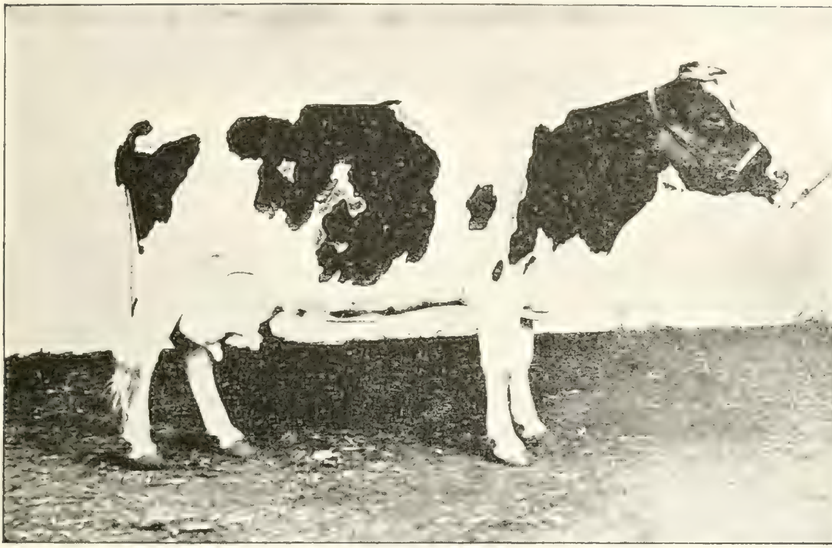
Pure-bred cows constitute only about 1.5 per cent of the cows raised in New York State. This number should be increased, for it costs no more to keep pure-bred animals than grade animals; and the profit from pure-bred animals is likely to be larger than that from grades. Furthermore, it is a great satisfaction to own a fine herd of pure-bred cows. Boys and girls should be taught to recognize the four leading dairy breeds of cattle and the four leading beef breeds. The lessons will give some interesting study in color and in markings, and the young persons will make a beginning on observation of cattle in the neighborhood.

The four great dairy breeds in New York State, in order of numbers of cows, are the Holstein-Friesian, called simply Holstein, the Jersey, the Guernsey, and the Ayrshire. The color of the pure-bred animals in each of these breeds is always the same within rather narrow limits. A pure-bred Jersey would never be mistaken for a Holstein or an Ayrshire, and very rarely indeed would she be mistaken for a Guernsey by any one with any real knowledge of the breeds.

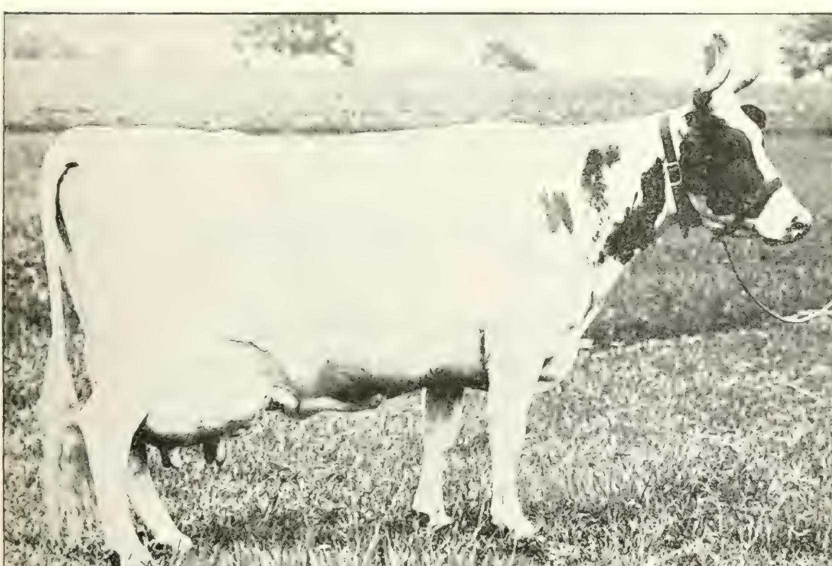
Jersey

Guernsey

Dairy



Holstein-Friesian



Ayrshire

breeds

This color characteristic is the one, perhaps, which is most surely transmitted from parents to offspring among pure-bred animals. Among grade animals, the color, in most cases, will be that of the breed of which the grade animal carries the most blood.

One way to become familiar with the different breeds of cattle is to see, as often as possible, copies of farm papers that give considerable attention to live-stock production.

The dairy breeds

The Jersey.— The color of the Jersey, in general, is solid fawn, varying through all the shades from light to dark, and becoming almost black in some cases. White is allowable and occurs in patches with sharply defined outlines in the general fawn color of the body. Jersey cows showing white are comparatively few in number. A Jersey usually has a black nose, a black tongue, and a black switch, but these points are not required for eligibility to registration. The hair along the back and under the abdomen, and that immediately surrounding the muzzle and the eyes, is usually lighter than on other parts of the body. The skin should be a rich yellow.

The Guernsey.—The Guernsey cow is generally larger than the Jersey and perhaps a little coarser. The color is yellowish, brownish, or reddish fawn. This is wholly unlike the fawn of the Jersey, and is not likely to be mistaken after a few individuals of each of the breeds have been seen. The reddish fawn prevails. White markings are more common with Guernseys than with Jerseys. White occurs most often on the limbs and the under part of the body. The muzzle of the Guernsey is buff or flesh-colored, and is surrounded by a circle of light hair. The eyes are surrounded by the same kind of marking. The Guernsey cow usually has a white switch.

The Guernsey is noted for the rich yellow color of the skin and of the secretions coming from the skin. There is supposed to be a relationship between this rich skin-color and the bright, rich yellow of Guernsey butter and cream.

The Holstein-Friesian.— The color of the Holstein-Friesian is black and white. There is no variation in shade, the only variation among individuals being in the amount of each color. At various times in the history of the breed, more white has been popular than at other times. For example, at present a Holstein bull calf having more than fifty per cent white will bring a larger price than an equally good animal having less white.

The Ayrshire.—The Ayrshire cow is red and white, although occasionally a brown and white animal may appear. In such cases, the brown always has a reddish tinge. As with Holsteins, a large proportion of white

is popular. The color markings in the Ayrshire are not so regular as the black and white of the Holstein. Often a white Ayrshire cow will be flecked with red instead of being marked in large patches or in any regular way.

The best way to learn the different characteristics in color is to see animals of each breed. It is suggested to teachers that the children be encouraged to tell what kinds of cows they have at home and to describe the colors. Visits to good dairy herds in the vicinity of the school will increase the interest in the subject and give the children first-hand study of animal life. Farmers who are good dairymen are proud of their herds and are pleased to have them noticed.

The beef breeds

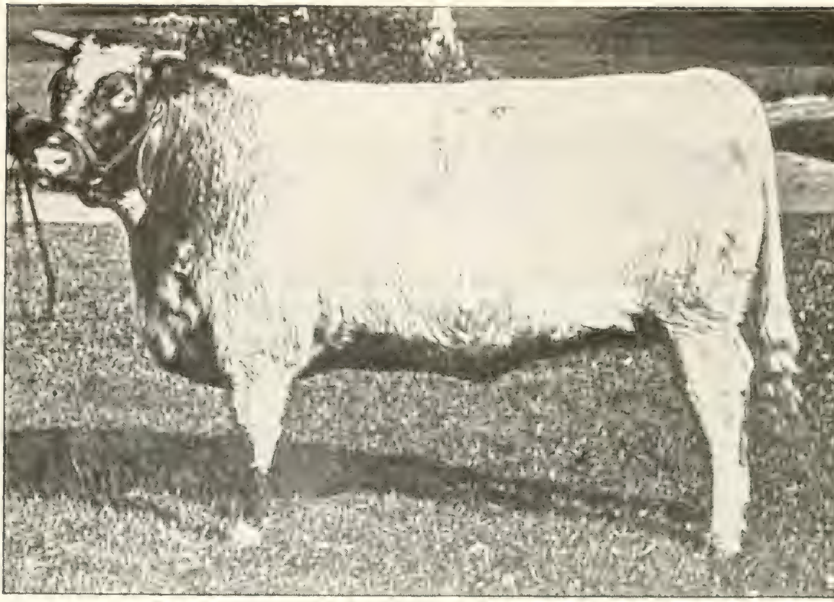
There are comparatively few of the four great beef breeds — Shorthorn, Hereford, Halloway, and Aberdeen-Angus — in New York, as this is primarily a dairy State. At one time Shorthorn cattle were in demand in New York, however, and in 1873, the highest price ever paid for a cow, $40,000, was paid for *8th Duchess of Geneva*, a Shorthorn. Beef cattle have given way to dairy cattle, and there are no large herds of beef animals except in one or two places. The influence of the Shorthorn blood has been left in the grade and the scrub herds, however, and there are many animals resembling Shorthorns. The grades of the other beef breeds are not nearly so numerous.

The Shorthorn.— The colors found among Shorthorn cattle are red and white in great diversity of proportions. There are wholly red animals and wholly white animals. Then there is found in large numbers the roan, a mixture of the red and the white with the colors grading imperceptibly into each other through a mixture of the red and white hairs. In some cases the colors are distinct, and the outlines of the patches of red are clearly defined. The illustration on page 1226 is that of a roan Shorthorn cow with some parts of the body graded into clear white and with other parts nearly a clear red.

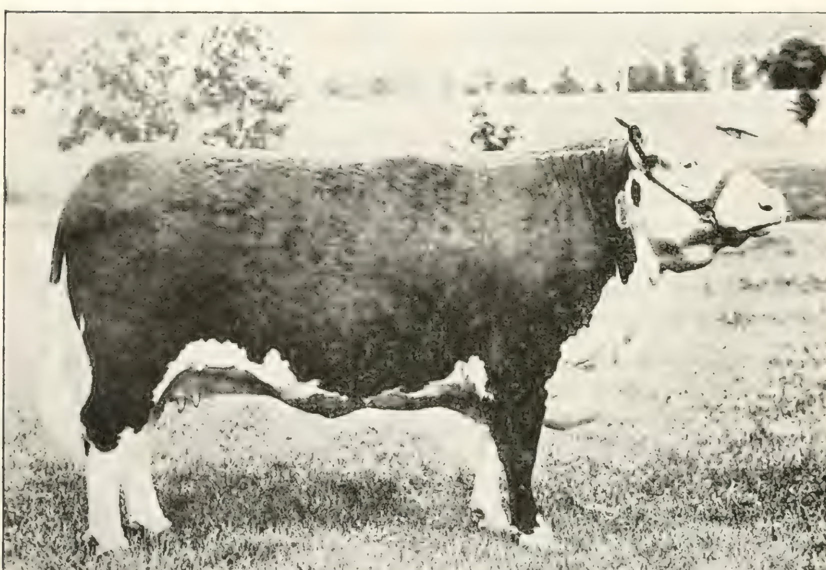
The Hereford.— The characteristic color markings of the Hereford cow are her white face, white line on the back, white underline, white markings on the legs, and white switch. There is no definite extent prescribed for these colors, but the face is always clear white, and the outlines of the other white markings are distinct. The body is a solid dark red.

The Aberdeen-Angus.— The Aberdeen-Angus cow is solid black and is distinguished from the Galloway by having shorter and straighter hair. The Angus cow is polled; that is, from birth she has no horns.

The Galloway.— The Galloway cow is also solid black with the best coat of hair of any of the breeds of cattle. The hair is rather long and

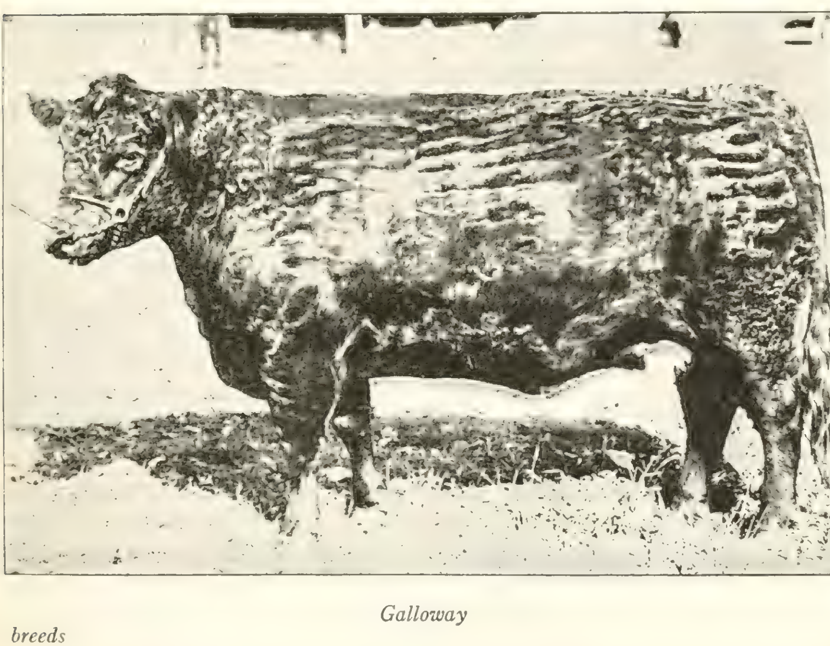


Shorthorn



Hereford

Aberdeen-Angus



Galloway

breeds

wavy. The hide of the Galloway is especially prized for robes and fur coats. This is a polled breed, also.

The cows of the different breeds cannot always be distinguished by color alone. Other characteristics, which have not been mentioned, may need to be considered; but the color will enable one to determine the breed in the great majority of cases.

VIII. SCORING AND JUDGING DAIRY COWS

E. S. SAVAGE

There is a noticeable connection between the form of a dairy cow and her ability to produce milk, and it is a knowledge of this fact that enables a dairyman to select a good producer. Familiarity with the relationships between form and function may be gained by practice in scoring and judging cows. For this purpose a score card, like the one given on the next page, is used. It shows the various parts to be considered, describes their ideal form, and gives a value to each. It will be seen at once, for instance, that the milk-secreting organs — udder, teats, and milk veins — are given thirty-six points out of one hundred, more than a third. They are, therefore, more important than the other parts. The chest is given ten points, because on its size and development the general health depends as far as it is controlled by the lung power, the heart, and the circulation of the blood. Thus each part receives a value, and it is important to know which are most essential and when they are well developed and proportioned. A single animal can be scored, deducting from the points allowed for each part as much as the animal seems to fall short of the ideal, and the sum of the points remaining will be the final score. Of course, to do this well requires experience and the scoring of a large number of animals.

Method of inspection.— The cow should be studied as a whole for her general appearance. She should be viewed first from the front, and her wedge-shaped form from the top of her withers downward noted. This will give an indication of her heart girth and the size and the strength of her lungs. The appearance of the head and the neck and the symmetry of this part of her body compared with the rest should be noted for balance, feminine appearance, spareness, and a general lack of beefiness or heaviness of neck and shoulder

The cow should be viewed next from the side and the wedge shape as formed by the top and the bottom lines should be noticed. If these lines were extended, they would form the point of the wedge somewhere in front of the cow. A large well-supported abdomen and udder, and a straight back line make a well-defined wedge shape. The cow should be spare in appearance with lack of beefiness along the ribs and the loin.

This point may be determined by feeling the condition of the skin over the ribs, testing it for looseness, thickness, and pliability.

SCORE CARD FOR DAIRY COW

Scale of points	Perfect score	Points allowed
General appearance, 27		
Weight—estimated..........pounds; actual........		
Form—wedge shape as viewed from front, side, and top........	5	....
Form—spare as indicated by prominent joints and clean bone and lack of muscular development along ribs and loins...........	8	....
Quality—hair fine, soft; skin pliable, loose, medium thickness; secretion yellow, abundant..............................	8	....
Constitution—vigorous as indicated by alert expression, evidently active vital functions, and general healthy appearance.......	6	....
Head and neck, 6		
Muzzle—clean cut; mouth large; nostrils large...............		
Eyes—large, bright..		
Face—lean, long; quiet expression.........................		
Forehead—broad, slightly dished...........................	6	....
Ears—medium size; fine texture..............................		
Neck—fine, medium length; throat clean; light dewlap........		
Fore and hind quarters, 11		
Withers—lean, thin; shoulders, angular, not fleshy.............	3	....
Hips—far apart; not lower than spine.......................		
Rump—long, wide, comparatively level......................	5	....
Thurls—high, wide apart.................................		
Thighs—thin, long......................................	2	....
Legs—straight, short; shank fine..........................	1	....
Body, 20		
Chest—deep; with large girth and broad on floor of chest; well-sprung ribs..	10	....
Abdomen—large, deep; indicative of capacity; well supported...	4	....
Back—lean, straight, chine open. Tail, long, slim, with fine switch..	4	....
Loin—broad..	2	....
Milk-secreting organs, 36		
Udder—large, long, attached high and full behind; extending far in front and full; quarters even..........................	20	....
Udder—capacious, flexible, with loose, pliable skin covered with short, fine hair..	10	....
Teats—convenient size, evenly placed........................	2	....
Milk veins—large tortuous, long, branching, with large milk wells.	4	....
Total..	100	......

From the rear of the cow, the wedge shape from the top should be noted. The withers form the point of this wedge, and the lines from the withers to the points of the hip bones form the sides. During the entire

study of the cow evidences of constitutional weakness should be looked for carefully.

After this preliminary study of form, quality, and constitution has been made, the cow should be studied in detail as outlined by the score card.

In general the ability of a cow to produce milk will be indicated by her strength of constitution, her capacity to utilize large amounts of food, and by a large, flexible, uniform udder capable of producing much milk.

Judging.— In judging a ring of three or more cows in order to decide how they compare with each other, the score card is seldom used, but the things learned from the score card are remembered and used as a basis of determining the good and bad points of the animals. Later they may be scored if desired to check the judgments made, or some expert dairyman may be asked to give his judgment. After much practice one can learn to choose the best-producing animals with a fair degree of accuracy.

IX. THE BABCOCK TEST FOR BUTTER-FAT IN MILK

R. A. PEARSON

The Babcock test is a quick and accurate method of determining the richness of milk, which means its percentage of fat.

Materials.— The materials needed are: a hand-power centrifugal tester, at least two milk test-bottles (Fig. 1), one pipette in which to measure the milk (Fig. 2), one acid measure (Fig. 3), one dairy thermometer, about one pint of sulfuric acid with specific gravity between 1.82 and 1.83, a few ounces of milk, and some hot water. All the necessary apparatus and acid can be bought for from six to seven dollars from any dairy supply company. They can be ordered through a hardware dealer. Sulfuric acid is sold also at drug stores.

Sampling the milk.— The milk to be tested should be thoroughly mixed just before the sample is taken, so as to make sure that the fat, or cream, is evenly distributed. This can best be done by gently pouring it back and forth between two vessels several times. The temperature of the milk should be between 60° and 70° F.

Place the small end of the pipette at the center of the milk and suck the milk up above the 17.6-c.c. mark. Quickly place the index finger over the upper end of the pipette, and by releasing the pressure allow the milk to run out until its upper surface is even with the 17.6-c.c. mark when the pipette is held straight up and down.

Place the point of the pipette a short distance into the neck of the test bottle, holding it against the glass with both pipette and bottle at an angle (Fig. 4). Remove the finger so as to allow the milk to flow

into the bottle. Be sure to get every drop of the milk, taking care to drain the pipette and to blow the last drop into the bottle. A little practice should make any one proficient with the pipette.

FIG. 1.— *Test bottle*

It is best always to make the test in duplicate; hence two bottles are needed for each lot of milk.

Using the acid.— The acid is very strong and must be handled with great care. If any gets on the hands, face, or clothing, it should be washed off quickly, and water should always be ready for this purpose. *Do not leave the acid where children can get it.*

FIG. 2.— *Pipette, or milk measure*

After all the samples of milk to be tested have been measured, the acid should be added. Fill the acid measure to the 17.5-c.c. mark with acid that is between 60° and 70° F. Pour this into the bottle with the milk, holding the bottle in a slanting position. The acid will then carry down any milk left in the neck and will follow the glass surface to the bottom of the bottle and form a layer under the milk.

Hold the bottle by the neck and mix the contents with a whirling motion for a few minutes, until no milk nor clear acid is visible (Fig. 5). By this time the contents will be dark-colored and hot. This change is due to the acid dissolving all the solid constituents of the milk except the fat, which it does not affect.

Whirling the bottles.— The bottles are whirled in order to separate the fat so that it can be measured. They should be hot when whirled. If necessary they may be heated by standing in hot water before being put into the machine. A steam machine is easily kept hot when in use. Other kinds should have boiling water placed in them.

FIG. 3.— *Acid measure*

Place the bottles in the machine so that each one will have another directly opposite, in order to keep the machine in balance. Whirl the bottles for five minutes at the proper speed for the machine in use (Fig. 6). With the pipette or other convenient means, add hot water to each bottle until the contents come up to the bottom of the neck. Whirl the bottles for two more minutes. Add enough hot water to bring the top of the fat nearly to the top of the graduations on the neck of the bottles. Whirl the bottles for another minute. The fat should then form a clear column in the neck of the bottle.

Reading the percentage.— Keep the fat warm so that it will be in a fluid

condition. Hold the bottle by the upper end of the neck, letting it hang in a perpendicular position, on a level with the eye. Read the marks, or graduations, at the extreme top and bottom of the column of fat. The difference between these is the percentage of fat in the milk. Some test bottles are made to read as high as 10 per cent, while others read only to 8 per cent. Each percentage has its number marked on the glass, and on the 10-per-cent bottles there are five small spaces each representing 0.2 per cent between these principal marks. Thus, if the top of the column of fat is even with the third short mark above the 7 mark, the top reading would be 7.6; and if the bottom is halfway between the first and the second short marks above the 3 mark, the bottom reading would be 3.3; the difference is 4.3, which is the percentage of fat, or the number of pounds of fat in 100 pounds of the milk tested. On the 8-per-cent bottles there are ten small spaces between each percentage mark, and each space represents one-tenth of one per cent.

FIG. 4.— *Putting the milk into the test bottle. The pipette is held at an angle with the test bottle and its point against the inside of the neck*

FIG. 5.— *Mixing milk and acid. A rotary motion with the bottle not pointed toward the face*

Notes

One c.c. means 1 cubic centimeter, or about 20 drops.

If the column of fat is clouded with white specks, probably the acid was not strong enough, or not enough was used, or the heat was not high enough.

If the column of fat is clouded with dark specks, probably the acid was too strong, or too much was used, or the heat was too great.

Always keep the acid bottle closed when not in use, or the acid will lose strength. *Remember that it is a poison and corrosive.*

FIG. 6.— *Whirling the samples*

POINTS TO BE ESPECIALLY NOTED IN MAKING THE BABCOCK TEST

H. E. Ross

1. Be sure to mix the sample of milk thoroughly before drawing it out with the pipette, but avoid making air bubbles.

2. When measuring a sample of milk with the pipette keep the index finger dry.

3. When measuring a sample of milk, keep the mark on the pipette on a level with the eye. The same precaution should be observed when reading the percentage of fat after the test is completed.

4. Do not try to measure a sample of milk by drawing the milk just to the mark on the pipette. Draw the milk *above the mark*, as directed.

5. When adding milk or acid to the test bottle, slant the bottle. The liquid will then run down the lower inside of the neck of the bottle, and will not be forced out by outcoming air.

6. Do not hold the bottle so that its mouth points toward yourself or any one else. The action of the acid on the milk produces great heat. This heat often causes the contents of the bottle to spurt out violently.

7. After adding the acid to the milk, shake the bottle thoroughly until the contents become dark in color.

8. After using the pipette wash it thoroughly, preferably in hot water. This will tend to prevent the transmission of disease germs from the mouth of one person to another, should any such germs be present.

9. The tester should be firmly fastened to a solid bench or table.

10. The person operating the machine should give his or her whole attention to it, and not allow the fingers or the clothing to get in the path of the bottle cups on an open machine.

11. Remove all objects from the vicinity of the tester. This will prevent their being hit by the bottle cups when the machine is in motion.

12. If acid is spilled use *plenty* of water, and then add an alkali, such as lime or baking soda, in order to neutralize the acid.

13. Do not leave the acid bottle uncorked.

14. Keep all glassware perfectly clean.

15. After washing the glassware, it is important to rinse it thoroughly in clean water so as to remove soap powder.

ANIMALS TO BE RECOGNIZED IN 1915-1916

THE DONKEY AND THE MULE

M. W. HARPER

The donkey is closely related to the horse, and was formerly used as a beast of burden to a greater extent than the horse. The earliest literature makes frequent mention of the donkey and its general usefulness to mankind. With the increasing usefulness of the horse, however, the donkey's influence rapidly diminished particularly in the new centers of civilization. Even to-day the donkey is extensively used in the older countries, particularly Asia and Africa.

Donkey

At the present time, however, the donkey is attracting increasing attention in western civilization because of the great economic usefulness of the mule. The mule is a hybrid produced by mating a jack, or a male donkey, with a mare. Since mules and horses are used for the same kinds of work, there is a tendency to develop types of donkeys somewhat similar to the types of horses. Thus there are a number of breeds of donkeys varying in size, conformation, and general activity. Most of the useful breeds of donkeys were developed in the countries of southern Europe, particularly Spain, Italy, and France.

The United States makes greater use of the mule than any other country in the world. Fully one-half of the total number are found in the United States. This seems strange in view of the fact that the older nations

Mule

of the world have developed most of the breeds of horses, and all of the breeds of donkeys.

VIRGINIA DEER

A. H. WRIGHT

Virginia deer are about six feet in length and stand three feet high. Their general color in summer is bright rufous chestnut, with a dark band on chin and throat; the belly, the underside of the legs, and the underside of the tail are white. The winter covering is coarse and is tinged with gray, or may be very bluish in early fall. The coat is shed twice a year, in June and in September. The change is gradual and does not affect all the parts at once. The antlers, possessed only by the buck, are about twenty-one inches in length and four and three-quarters inches in circumference at the base. They curve outward and upward, the tips turning in toward each other. A short, upright spike is given off near the base, beyond which the beam develops two upright branches, making three nearly equal prongs. In battle the animals approach with bowed heads and the tines meet, shielding each animal from the points of the other. Sometimes the antlers interlock so that the animals cannot sepa-

rate and as a result starve. The growth of an antler is very rapid. Starting as a mere buttonlike growth in the middle of May, it attains its full size by September. It is covered with velvet, which carries a blood supply until the buck is full grown, when he rubs the velvet off by scraping his horns on bushes and rock ledges.

Virginia deer do not migrate, and the individuals have a very small home range. Ordinarily they have a low, smooth, bounding gait, with an occasional high jump. Their footprints are arranged alternately in a double row. The hind foot falls exactly in the mark of the fore foot, which makes an impression about five and one-half inches in length. The two parts of the hoof are very sharply defined and are often unequal in size. Deer are good swimmers.

Virginia deer

These animals do not make a nest. The young are born in the middle of May, usually two fawns at a time. The mother hides them in some sheltering underbrush, whither she comes to nurse them. The coat of the young is a rich bay, with clear white spots, which coloring is lost after about four months. These little animals are exceedingly graceful. The males follow the mother for one year, the females for two years. They have many enemies, including bears, wolves, panthers, lynxes, foxes, and eagles.

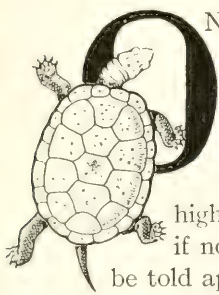
In summer, deer follow the watercourses, and they feed on herbs, grasses, marsh or aquatic plants, leaves of deciduous trees and shrubs, berries and fruits whenever within reach, and as many beechnuts as can be found. As winter approaches they gather in bands, and when the weather grows severe they congregate in a "yard," which is a cleared, stamped-out space with a wall of snow about it. Here their food consists of buds, low deciduous trees, twigs and foliage of arbor vitæ, hemlock, and balsam, and a few mosses and lichens.

Deer can be readily semidomesticated for park purposes, but they are treacherous and dangerous as pets.

TURTLES

A. H. WRIGHT

Editor's note.—Of the small animals in wild life few are so valuable for schoolroom study as are the turtles. The snapping turtle and the soft-shelled turtle are not safe to handle, but the smaller turtles that the children find can easily be studied, and are so interesting in appearance and habit that children never cease to find wonder in them. It is comparatively easy to provide proper quarters for turtles in the schoolroom in a terrarium, or a cage where earth, plants, and a basin of water can be arranged. A painted turtle once became the pet of a class of children in a village school, and the children took turns in taking it home overnight. Familiarity with this one species led to a quest for others. The teacher, through the inspiration that the turtle brought to the school, was able to encourage the children to work harder on some of the essential school subjects in order to have more time for the out-of-door work.



ON the whole, turtles are harmless, timid, cold-blooded creatures, with bony shells made in two parts, the upper part being called the *carapace* and the lower part being called the *plastron.* The more aquatic species feed mainly on animal food, and have webbed feet and flattened shells; while the land forms have highly arched shells and club-shaped feet, and feed largely, if not solely, on vegetable matter. Usually the sexes can be told apart. The male has the plastron concave instead of convex or full, and the tail of the male is much thicker and longer than that of the female. All turtles lay their eggs in sand, mud, clay, or humus, and cover them up after depositing them. The hole may be dug with the fore feet or with the hind feet or with both. The eggs are white, usually elliptical but sometimes spherical in shape, and have a tough shell. Most turtles' eggs hatch in the fall, but sometimes they winter over and hatch the following spring or early summer.

The kinds of fresh-water turtles in New York State are twelve in number, and fall into four groups: (1) snapping turtles; (2) soft-shelled turtles, or leatherbacks; (3) mud turtles; (4) pond turtles.

1. The snapping turtles are represented by one species, the common snapper, which ranges from Canada to Ecuador. The shell reaches a length of fourteen or fifteen inches, and the larger specimens weigh from twenty to forty pounds. Its upper shell is a dark or dull brown or olive, and its under shell is pale yellow. In the young there are three keels, or ridges, on the back, but in the adult these are much reduced. It differs from the very large alligator snapper (not found in New York State) in having five instead of seven rows of plates on the upper shell. The other distinguishing marks are a cross-shaped under shell, or plastron,

a long tail with a crestlike series of plates along the back, a large, powerful head, and limbs little protected by the under shell.

Young snapping turtle, natural size. Note cross-shaped plastron

The snapping turtle appears from hibernation about the last of March, or during the first weeks of April. In open winters it may emerge from the mud occasionally for short periods. It prefers muddy, quiet ponds and streams, although it is discovered, also, along the edges of clear streams and lakes. It crawls along the bottom or swims slowly with its head above the surface of the water. It is protectively colored, looks much like its environment, and usually has considerable mud on its back with algæ actually growing on it. Like the musk turtle, it possesses a disagreeable odor.

When alarmed, it rests, partially covered in the mud, where it also lies in wait for fish, tadpoles, frogs, or even young waterfowl. It spoils more than one boy's fishing for bullheads or suckers, and is hard to land. This deliberate moving reptile is very courageous and pugnacious. Like a snake or soft-shelled turtle, it strikes at its enemies or prey, and its bite is very much to be avoided. In fact so tenacious is its hold that it may maintain it even if the head be severed from the body. Many persons esteem as a luxury the so-called " nine kinds of meat " in the snapping turtle.

In June and July the female turtle seeks a sandy bank near the water, and scoops out a funnel-like hole one foot wide at the bottom, in which she lays from thirty to seventy round, tough eggs. These are an inch, or slightly more, in diameter and are covered over with from six to twelve inches of sand. About the last of August or early September, the eggs hatch, and the young hasten to the water.

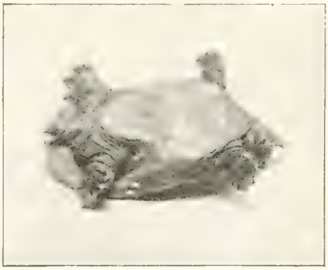
During the summer the adults rarely appear on land except for breeding purposes, or, possibly, for food, or in traveling from one pond to another. In late October or early November, these sullen, sluggish, and vicious animals go into the mud of ponds, streams, and lakes, to remain over winter.

Young snapping turtle, natural size. Adult fourteen times larger

2. The soft-shelled, or leatherback, turtles are very flat and broad. The carapace and the plastron are leathery, with thin margins, and no horny external scales. The snout is long and leathery, and the nostrils are on its tip.

The spiny soft-shelled turtle is the only species in New York State. It has a series of spines on the front edge of the carapace, and can completely retract the head and the feet. In color it is olive brown, slaty, or greenish. On the carapace are round brown spots, each margined with a ring of black. These spots are largest in the middle of the upper shell. The under shell, or plastron, is pure white. The broadly webbed feet are white, spotted with black.

The spiny soft-shelled turtle is common in the Central States and the Great Lakes region, and is occasionally found in New York State. It comes out of hibernation the last of March and throughout April. It may float on the surface of the water or, very commonly, bask on some floating log or perch. It seldom leaves the vicinity of water, is an excellent swimmer, and under water it can breathe as well as any fresh-water turtle. When danger approaches, no turtle is quicker to escape. It can bury itself in sand or mud in an incredibly short time, and, when tormented on land, can leap its whole length. When caught it is ferocious, and can give a savage bite. Its food is largely, if not solely, animal in nature and consists of insects, crayfish, small fish, and frogs.



Young soft-shelled turtle, natural size. Adult ten times larger

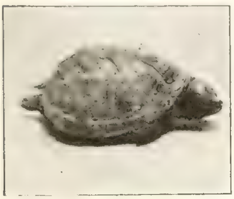
In June and July the shy female seeks the sandy or clayey edges of lakes and ponds, or sandy fields near swamps, and deposits her eighteen to twenty-five spherical eggs from six to eight inches deep in the earth. The eggs are about the size of those of the snapping turtle, one inch in diameter, or slightly larger. In August or early September the young appear, and about a month later they and the adults of this fearless species burrow into the mud of ponds and lakes, where they remain over winter.

3. The mud turtles of New York State are small in size, and two in number: the common mud turtle and the musk turtle.

(a) The mud turtle has a shell from three and one-half to six inches long, and dark or dusky brown or olive in color. The mud turtle is found in the United States east of the Mississippi Valley, but is rare north of Pennsylvania. It differs from the musk turtle in having a larger under shell, or plastron, which protects the legs. The plastron of the mud turtle has a hinge across the middle so that it can close up and protect the animal. The rear margin of the plastron is notched instead of even, as in the musk turtle, and the head of the mud turtle has no stripes on it. The male has a sharp, nail-like point at the end of

his short, stubby tail. The mud turtle has less odor than the musk turtle.

The mud turtles appear from hibernation in April. They frequent ponds, muddy streams, side inlets, stagnant edges of swamps, and large railroad ditches, where they usually remain crawling about on the muddy bottom for fresh insects, worms, and the like. If they are alarmed when on land, they usually withdraw into their shells, but at times they give their enemies severe bites. When in the water, however, they bury themselves in the mud at the approach of danger. They do not bask as much as the pond turtles, usually showing only the head above water.

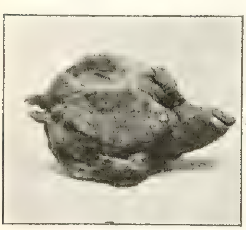


Young musk turtle, natural size. Adult six times larger

In June the female seeks out muddy or sandy soils, or decaying humus or rotten wood in woody places or other situations, and lays from four to eight eggs at a depth of from three to four inches beneath the surface. The eggs are elliptical, one and one-eighth inches long, and seven-eighths inch in diameter, and have a brittle shell. Some snakes are particularly fond of them.

(b) The musk turtle looks somewhat like a small snapping turtle because of its very narrow plastron, which does not protect the fleshy under parts. The plastron is more or less cross-shaped, and cannot be closed. The musk turtle has two yellow head-stripes from the snout to the neck, and the upper shell is more arched, or dome-shaped, than that of the mud turtle.

The musk turtle is found in North America east of the Rocky Mountains. It appears from hibernation about April 1, and may choose deeper water than the mud turtle, but at times they are found together in shallow, muddy ditches or stagnant swamps. Its obscure color, the slight swellings on the naked parts, and the algæ growing on the upper shell, make the musk turtle very inconspicuous while crawling in the weedy bottom. It may or may not bask in the air, but, usually, only the yellow-striped head protrudes through the pond scum or the algæ at the surface of the water.



Young musk turtle, natural size

The musk turtle receives its name from the musky secretion of glands in the region of the hind legs; this doubtless serves as a means of defense, for, although the musk turtle avoids danger whenever possible, it will defend itself with spirit. This turtle is a nuisance to fishermen, and straightens more than one hook, or forces the fisherman to cut off the hook rather than extract

it. The food of the musk turtle is any kind of refuse, preferably animal matter. It is recorded that the male musk turtles can produce music, which resembles grasshoppers' singing. On the hind legs there are two patches of small horny knobs, and by rubbing the lower set on the upper one, the music is produced. Probably these sounds are made only at the breeding season.

The laying season seems to be from June 10 to July 1. The female has only from three to six eggs to lay, and she usually seeks decaying wood or humus in which she digs a nest with all four feet. The nest is only from two to three inches deep, and is always covered. Mr. T. S. Hankinson records that occasionally all of the females of an area lay together in an old muskrat house, and in one such house he has found from seventy to ninety eggs. The eggs are elliptical, one inch long, and five-eighths of an inch in diameter. In October musk turtles go into hibernation.

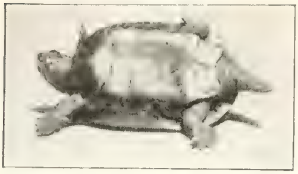
4. The pond turtles, or the terrapins of the fresh waters of New York, are eight in number. They are the painted, the western painted, the Muhlenberg's, the spotted, the wood, the geographic, the box, and the Blanding's turtles.

Young painted turtle, natural size. Adult six times larger. Note markings on lower edge of carapace

(a) The commonest and one of the best-known water turtles of the eastern United States is the painted turtle, the shell of which reaches a length of six inches. The color is greenish black, dark green, or dark olive on the upper shell, or carapace. The edge of each scale on the back has a yellowish margin. The under shell, or plastron, is clear yellow, and the under margin of the carapace is conspicuously marked with crimson. The head is black with numerous yellow stripes on its lower side, and the limbs have prominent stripes of crimson.

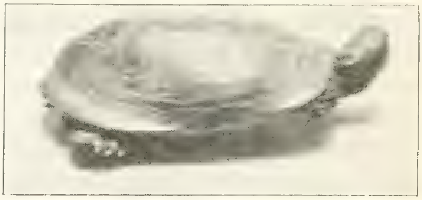
The painted turtles are fond of basking on logs, driftwood, stumps, and banks, sometimes wholly out of water, and sometimes partly in the water, which may explain the frequent growth of algæ on the rear portions of the carapace. These turtles are timid, and when approached, tumble into the water, where they often rest under the surface algæ with only their heads out. They quite often travel on land for short distances from the water. When teased they may try to bite, but they usually rely on the protection of their shell. Their food may be either animal or vegetable matter, the latter especially when they are on land. They feed principally, however, on dead or live fishes, insects, tadpoles, and the like.

The male of the painted turtle has the habit at the breeding season of opposing the path of the female. When he has stopped her, he begins to beat her head and eyes with his long finger nails. She escapes to be captured again, when the male repeats the performance. The female sometimes travels some distance from the water to lay her eight to ten eggs in clayey or sandy soil. The eggs are elliptical, about one and one-fourth inches long, and from five-eighths to three-fourths of an inch in diameter. Usually the eggs hatch in September, but sometimes they winter over, and the young issue forth the following May or June. Rarely in the middle of October one may find the painted turtles betaking themselves from clearer waters, to swampy or muddy ponds where they hibernate.



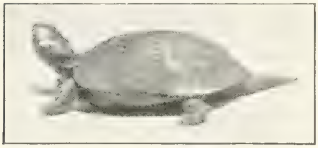
Male Muhlenberg's turtle, one-fourth natural size. Note concave plastron and thick tail

(b) The western painted turtle has the same habits and appearance as the painted turtle, except that the three rows of scales on the back do not form straight cross rows of three, but alternate with each other.



Female western painted turtle, one-fourth natural size

(c) The Muhlenberg's turtle is very rare and peculiar in its distribution. It has been recorded near Geneva, near Ithaca, in the headwaters of the Delaware River, in southeastern parts of New York State, in New Jersey, and in Pennsylvania. Its carapace is somewhat like that of the spotted turtle, but is higher and narrower. The blackish or brownish black plates may have a series of grooves, one within the other, or they may be smooth. The plastron is the same color as the carapace, or it may have a slight splash of yellow or brown. The distinguishing mark is a round orange spot on each side of the head. The upper jaw has a deep notch. The Muhlenberg's turtle appears from hibernation between April 10 and May 1. It inhabits the clear waters of marl ponds, the narrow, grassy streams of sphagnum moss swamps, and the cold, clear water of alder swamps and thickets. It is a smaller turtle than its common swamp associate, the spotted turtle. Its shell seldom exceeds four inches in length. It is not so active as the spotted turtle, and when



Male Muhlenberg's turtle, one-fourth natural size

alarmed seeks protection in the grassy shallow water of its environment. Its food may be either animal or vegetable matter. Of its breeding habits there is a single record of a female in captivity laying her eggs between July 20 and August 5.

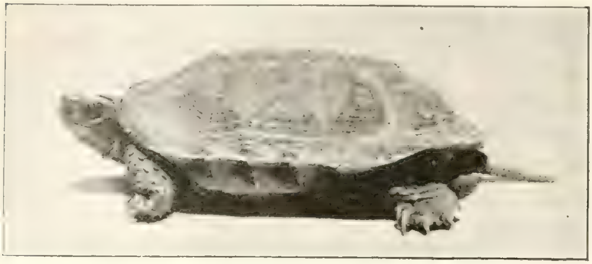
Female spotted turtle, one-fourth natural size

(d) The spotted turtle is second to the painted turtle in abundance in New York State. Its carapace is black, with round orange spots, which are also on the head, and it is just as flat as the painted turtle. The plastron may be black, or yellow or orange-red heavily blotched with black. The fleshy parts are orange and black, and the upper jaw is slightly notched. The spotted turtle's shell is from four and one-half to five inches long — slightly smaller than that of the painted turtle. The spotted turtle ranges from New England to Indiana and North Carolina. It appears from hibernation in the spring about the last of March or the first of April, and frequents ponds, swamps, inlets, and small waterholes. It seems to prefer swampy places more than most other species, and is common in marly ponds and sphagnum moss swamps, and may be found in some of the most transient pools. It is fond of basking with others of its kind on logs or any rest above the water, and hurriedly falls into the water at the approach of a person. Like the painted turtle it will live on animal and vegetable food, and is a scavenger. It feeds mostly on fish, frogs, tadpoles, insects, and worms. In the middle of June the female digs a hole in the muck or the dirt of swamps or wet woods, and lays a few eggs. These are elliptical, about one and one-fourth inches long, and three-fourths of an inch in diameter. As in the case of the painted turtles, the young hatch in August or September.

Female spotted turtle, one-fourth natural size

(e) The wood turtle, called also wood terrapin and wood tortoise, is much larger than the Muhlenberg's turtle, its shell reaching a length of seven or eight inches. The carapace is more or less keeled, or ridged down the middle, and has prominent raised ridges, one within the other, on each plate. These rough plates also have yellowish or brownish radiating lines. The plastron is prominently notched behind like that of the Muhlenberg's turtle, and each plate is yellow with a prominent black blotch on the

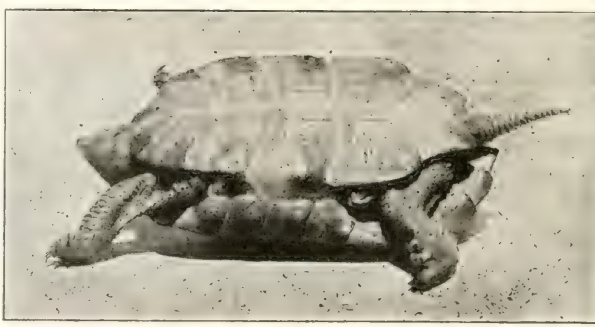
outer edge. The same coloration is found on the under margin of the carapace. The fleshy parts, except the head and the chin, are a beautiful reddish brown or vivid orange-red. The top of the head is black, and the chin is yellow with irregular darker markings.



Female wood turtle, one-fourth natural size

The wood turtle is often found in the Eastern States as far north as Pennsylvania. It is not a common form in New York. It usually appears from hibernation the last of April. It frequents the paths of upland streams, and the banks of lowland watercourses. In the spring this species may be found in the water, but, in general, it lives on land in damp places, and almost invariably in shady wooded districts. The male has a sweet piping note, which it gives when it approaches the female. This observation has been made in May and June when several wood turtles occasionally congregate in woody, sandy flats along some stream. Little is known of the breeding habits. Agassiz says that their eggs are elliptical and gives the dimensions as one and one-half inches long by seven-eighths of an inch in diameter. The food of these turtles is largely vegetable in nature, but some insects, worms, and the like, enter into the diet. Few wood turtles are seen after the last of September; in fact the species is a solitary one except at the breeding season.

(f) The geographic turtle, or map terrapin, is not uncommon in the Central States, but it is found rarely along Lake Ontario and in the western part of New York State. It is a broad turtle, with a more or less depressed shell from eight to twelve inches long. On the middle of the back is a keel, or ridge, which is continuous instead of knobbed. In color the carapace is yellow brown or



Female wood turtle, one-fourth natural size

dark olive, with a network of greenish or yellow lines on each plate. The markings give rise to the common names of this species. The broad plastron is wholly or largely yellow, and is notched behind. The soft parts are also striped with greenish yellow lines. A bright yellow comma-shaped spot behind each eye distinguishes the geographic turtle from Le Sueur's terrapin, which is not found in New York State.

The geographic turtle is one of the most strictly water species, frequenting lakes, inlets, streams, and rivers. Early in April it appears from hibernation, and is very often found basking. With its webbed feet it can swim very readily, and because of its sensitiveness to danger, it is one of the most difficult turtles to capture in midsummer. The diet of the geographic turtle seems to be limited to shellfish and molluscs, and, for this reason, it may be difficult to keep this species in captivity. It seldom attempts to use its strong jaws on a person.

The female seeks out plowed land or sandy places, and in a flask-shaped hole lays two layers of eggs. These are carefully covered, and are usually from twelve to fifteen in number. They are elliptical in shape, and have rather soft shells. In August and September the young hatch, although they occasionally issue from the nest the following April or May. In the fall this species hibernates in the mud of ponds and inlets.

(g) The box turtle, or tortoise, has a very high, arched carapace, giving it a hemispherical or a globular appearance. The plastron has a transverse hinge by means of which the animal can close itself up securely within its shell. The carapace is bluntly keeled, and may be brown-black with irregular yellow spots. In the male the rear section of the plastron is concave, and some zoologists state that the males have red eyes. The feet are more or less club-shaped, which suggests the land habits of this form. Box turtles seldom appear in the water, but usually frequent dry, moist woods, grassy thickets, tilled fields, and sidehills. The box turtle has a mixed diet, feeding on insects, worms, and plants. By nature it is a timid and harmless creature. When danger appears, it withdraws into its shell, and the front and the rear halves of the plastron completely close over the soft parts. Many box turtles that have been marked on the shells have been seen from twenty to seventy years later, and in several instances, these individuals apparently have not traveled far from the one locality. In captivity box turtles have been known to live from ten to twenty years. During very hot summers these animals temporarily burrow into the moist ground, and in the winter they remain buried in the soft earth. In June or later the female may lay her four to seven eggs beneath leaves or in soft earth, a few inches below the surface. The eggs are oval, about one and one-half inches long, and three-fourths of an inch wide.

(h) Blanding's turtle, or the semibox turtle, is a native of the Central States but is found in Ontario and rarely in western New York. The shell measures eight or nine inches in length, averaging about two inches longer than that of the box turtle, but it is not quite so high. Unlike the box turtle, its feet are fully webbed. The carapace is black with numerous small yellowish spots. The plastron has a ligament connecting it with the carapace on each side, and has a good transverse hinge, which enables its owner to close up like a box turtle. The notched plastron and hooked upper beak of the box turtle are not present in the Blanding's turtle. This species is more or less aquatic, frequenting large streams, ponds, and occasionally swampy areas. It often takes to the land like the box tortoise, and relies for protection on withdrawing into its shell. Usually it escapes into the water as readily as a painted turtle, and can swim nearly as well. It probably deposits its eggs in sandy places. Agassiz says that the female lays from seven to nine eggs, which are oval, one and three-eighths inches long, and one inch wide. The eggshell is thick, hard, and smooth.

FIELD MOUSE

A. H. Wright

The field mouse, or meadow vole, is six and one-half inches in length, and has a thick, compact body, short legs, and very short ears. In color it is dark brown above, sprinkled with black, the under parts gray, often washed with buff. Field mice are abundant in fields and meadows, and feed mainly on grains and roots of grasses. They make considerable inroads on grain when it is in the shocks, but seldom occur in sufficient numbers to do serious damage. In winter they sometimes injure trees by gnawing the bark, especially when the snow is deep.

Field mouse

Field mice are active either by day or by night, and remain on the ground. They dig simple burrows, barely a foot in length, with a nest of grass at the end; or they may have galleries under a board or a woodpile. They are very prolific, having from four to eight young at a time and raising several litters a season. In the spring they nest just below the surface of the ground; later the nest is often found in a little depression on the surface. In winter they live in nests above ground, having runways

leading out under the snow. These tunnels have frequent doorways to the surface, but the mice seldom come out in winter. Their small footprints are arranged in twos, the hind feet falling exactly in the prints of the fore feet. They have many natural enemies, such as marsh and rough-legged hawks, all the smaller hawks and owls, shrikes, skunks, weasels, and the diminutive mole-shrew.

SQUIRRELS

A. H. WRIGHT

There are several kinds of squirrels in this State, which differ widely in their appearance and habits — red, gray, fox, and flying squirrels, chipmunks, and woodchucks.

Red squirrel

The red squirrels, or chickarees, are well-known little "chatterboxes," found in all our woods, even among the densest evergreens. Their size is small — they are twelve and one-half inches in length; their backs are red, varying in shade, and the under parts are white or gray. They are the proud possessors of bushy tails. They are queer bundles of characteristics, inquisitive, audacious, insolent, and mischief-loving, but intelligent, persevering, industrious, and clever, with an irresistible sense of humor. Chattering and busy throughout the day, they cut off pine cones before they are ripe and chestnuts while still in the bur. They store mushrooms in the forks of trees, awaiting the time of need. Their food is varied: nuts, acorns, seeds and roots, buds and leaf stems of certain trees, several species of toadstools and other fungi, seeds from cones of pines and spruces, fruits and berries, beetles, birds' eggs, and even young birds. Scraps of meat or fish prove very acceptable whenever available. The red squirrels are expert climbers and good swimmers, and make good time in covering the ground. They travel by bounds, and leave footprints that consist of three or four impressions, the hind feet falling just ahead of and outside the fore feet. Unlike the track of the rabbit, the toe marks are distinct. In the tree tops the red squirrels are perfectly at home and can climb out on the smallest twigs. They often establish regular paths from their nests to their feeding grounds, passing from tree top to tree top with quick, light jumps. These squirrels do not hibernate, but retire to their nests for the worst storms. The nests may be located in a hollow limb, a hollow in the ground, or a hollow log; or sometimes the squirrels build outside nests of twigs and bark, which are great, ball-like structures, sixteen inches across with a chamber of six inches. These they often place high up in evergreen trees. The four to six young are born about the first of April.

Gray squirrel

The gray squirrels are larger than the red, being nineteen and three-quarters inches in length. Their backs are a clear silvery gray in winter, tinged with yellow in summer; the under parts are white, occasionally blotched with rust color; the ears are whitish. A black phase of this animal is rather common, both colors being found in one litter. Occasionally white forms are recorded, as is true also of the red squirrel. The gray squirrels are not fond of evergreen forests, as their smaller brother is, but prefer the hardwood groves, especially the beeches, which supply them both nuts and favorable sites for their outside nests. These water-tight apartments are built wherever the weather is not too severe, and whenever a convenient woodpecker's hole or a hollow tree or limb is not found. From below, these structures look like crows' nests, as they are built on platforms of twigs. They are so well covered that they shed the rain. Leaves are used to a considerable extent in the construction of all the nests. Nuts are the principal food of these squirrels, and they begin to eat these long before they are ripe; and they store large quantities for winter and spring. They do not gather these together in one place, but prefer to hide a few in one spot. To find them again, they must be largely dependent on their acute sense of smell. They have a saucy cry of *qua-qua-qua—qua-a-a*. These alert squirrels usually escape capture by clinging to the side of the branch or trunk of the tree opposite the enemy, whether hawk or boy; but in captivity they are easily tamed and make very intelligent pets.

Gray squirrel

Fox squirrel

The largest of the squirrels found in New York are the fox squirrels, which are twenty-three inches long. They are very scarce in this State except in the lower part. Their backs are always tinged with rust color; the under parts are never pure white, varying from bright rust color to rusty white; and the ears are rust-colored. Black and semiblack individuals are found also in this species.

Flying squirrel

The little flying squirrels, only nine inches long, are quite unlike the other squirrels. They have what none of the others have — broad, furry membranes connecting their front and hind legs. With their beautiful bright eyes, their drab backs somewhat shaded with russet, and their white under parts, they are as dainty animals as one could wish to see. They live on nuts, seeds, and buds, and also on beetles and perhaps other insects. Occasionally they eat flesh. Their nests are in hollow trees, often in deserted woodpeckers' holes. Here several of them often live together, and they may be aroused easily and driven out by hammering on the tree trunk. In accordance with their nocturnal habits they come out just at nightfall, climb to the top of a tree, and sail to the foot of another tree perhaps fifty yards away. Then, climbing this tree, they glide to another. They live in seclusion during the severest weather, but it is not known that they regularly hibernate. The young, numbering from three to six, are born early in April.

Chipmunk

The chipmunks are ten inches in length and reddish or yellowish brown in color, with five black and two whitish stripes down their backs. They are very fond of nuts, preferring beechnuts; but they will eat roots, corn, and other grain, and the larvæ of certain insects. They put away large stores in their burrows, for they stay in winter quarters from the middle of November until March or April. Sometimes they come out and look around on a bright winter day. From one nest occupied by four chipmunks there was once taken a quart of beaked hazelnuts, a peck of acorns, some Indian corn, two quarts of buckwheat, and a very small quantity of grass seeds. All this they had industriously gathered and carried to their storehouse in the large pouches of their cheeks. They often have temporary "caches" carefully hidden among the leaves for one of their "cheek-loads." The chipmunks are diurnal in habit and stay on the ground most of the time, except when some venturesome sprite goes after

Flying squirrels

seeds in a tree. When surprised by a passer-by, they utter a sharp *chip-per-r-r-r* and dash for a retreat, preferring a loose brush heap, a rail fence, or a similar structure, where they can watch readily and change their position frequently. Their homes are long, crooked tunnels in a bank, with entrances in a thicket. The burrows are one and one-half or two inches in diameter, and have a network of branches. The nests are deep in the ground. The four or five young leave the nest by June and are full-grown by August.

Woodchuck

One scarcely associates the slow-moving woodchuck with its stout heavy body, with the other spry squirrels to which it is related. Its tail is short and densely covered with long, rather stiff hairs. In color the coat is grizzly gray varied with chestnut, yellow, or black, with the under parts reddish. Partly or wholly black individuals are not uncommon, and white ones are seen occasionally.

Woodchuck

The woodchuck is a woodland animal, but prefers to have its home on the edge of a sunny opening or near a rolling pasture. The burrows are of varying complexity from seven to fifty feet in length, and with one or more nesting chambers. The woodchuck chooses woodland burrows in which to hibernate with its mate. Although sluggish in movement, rarely climbing trees, swimming poorly, and returning to its burrow whenever pursued, it is, when at bay, a fighter that knows no surrender.

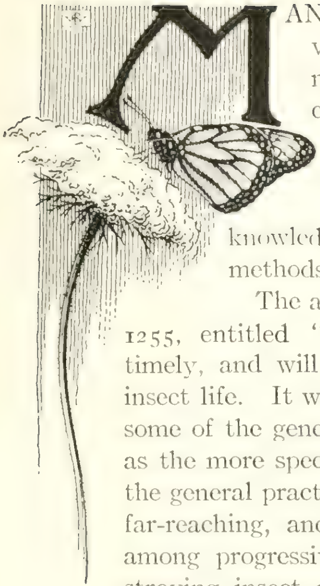
The four or five undeveloped young are born in the underground nest about the end of April and remain in the den until mid-June. The male woodchuck sometimes returns home when the young can venture forth. It has been reported that the woodchuck can sing, producing birdlike notes resembling those of canaries.

Although the woodchuck is a profound hibernator, it sometimes comes out while the ground is still covered with several feet of snow. The tracks it makes are commonly in pairs, a few inches apart, one a little in advance and showing distinct thumb marks.

The favorite foods of the woodchuck are grass and clover.

INSECT STUDY

THE EDITORS



MANY teachers find that the study of insect life is valuable, both from the point of view of general natural history and from that of economic agriculture. The life histories of some of the insects are among the most interesting in the living world. The loss to the farmer, due to insect pests, is very great; therefore a knowledge of the most troublesome insects and the methods of controlling them is important.

The article by Professor Glenn W. Herrick, on page 1255, entitled "Are Insect Foes Increasing?" is especially timely, and will afford a good background for the study of insect life. It would be well to discuss with the boys and girls some of the general methods of controlling insect pests as well as the more specific measures for each insect studied. Among the general practices spraying is one of the most important and far-reaching, and in these days has become almost universal among progressive farmers. The importance of birds in destroying insect pests has not been sufficiently realized in the past, and the destruction of and the indifference toward bird life have had a direct influence on the increase of insect enemies. Now the birds are being protected and encouraged because of both their æsthetic and their economic value. Crop rotation aids in the control of harmful insects. If the same crop is grown year after year on one field, its insect enemies will multiply in that locality, and after a time become very much more troublesome than they would be if the crops were changed from field to field each year. It is important that waste and wild places on a farm be cleaned up and kept in such condition that they do not afford breeding places for harmful insects. This applies to fence rows and corners, abandoned pastures, and like places. That apple-tree tent caterpillars have gained such headway in the State has been due, somewhat, to the fact that there have been such large numbers of wild cherry trees in out-of-the-way places, which have not been properly inspected.

In making a study of insects, the living forms should be used as far as possible, and it is comparatively easy to keep them in the schoolroom for a few days in a terrarium or a temporary cage made of a lamp chimney covered on top with a piece of cheesecloth. In this way the transformations that occur in the lives of practically all insects can be observed, as well as the identifying characteristics of each species.

For various reasons it is not desirable in rural schools to attempt to make a general collection of insect life. First, some of the insects that would be collected in such cases are beneficial instead of harmful; second, children should be taught to observe and appreciate these forms in the living state; and third, insect collections are very difficult to preserve for more than a year or two with the materials that are available in the school.

It is desirable, however, to make each year collections of the injurious insects that will show the different stages in the life history of each species. With the collection there should be given a statement of the method of control, which will be based largely on the life history and the habits of the insect.

In addition to the insects given in the State syllabus for special study and recognition during the coming year, it is recommended that one biting and one sucking insect be studied. On pages 1264 to 1274 there is a series of short articles on several of the more important biting and sucking insects. In the list there is included one insect that is beneficial instead of harmful in the belief that it is as important to recognize the insects that are a help to the farmer as it is to know those that are injurious. From time to time the attention of teachers and children will be called to some of the insects that are beneficial.

In the list of biting and sucking insects, the article on the apple-tree tent caterpillar is reprinted from the leaflet of last year. This is done because the apple-tree tent caterpillar is still a serious menace, and because it affords a good opportunity for boys and girls to assist in the control of a harmful insect. For the past two years school children in all parts of the State have been collecting and destroying the egg masses of the tent caterpillar during the fall and winter, and reports have been received at the College showing that by actual count more than four million egg clusters have been collected and destroyed, which at an average rate of one hundred and fifty eggs a cluster would make a total of over six hundred million eggs, a large percentage of which would have hatched into caterpillars had they been allowed to remain on the trees. Experience has shown that it is very easy to strip off the egg rings without injuring the twigs, and this is the most satisfactory way.

Another phase of insect life can be studied in connection with the apple-tree tent caterpillar, for it has as an enemy a wasplike insect that kills the tent caterpillar in the pupa stage in the cocoon. Therefore wholesale destruction of the cocoons as well as of the egg rings is not recommended because many of the beneficial parasites might be destroyed in the former case. The cocoons can be found during June and July and may be collected and kept in jars covered with cheesecloth or netting until

the insects emerge. When this happens, the wasplike parasites can be released to continue their work against the tent caterpillars, and any old cocoons and tent-caterpillar moths remaining can be destroyed.

At best the effort that man makes to control insect pests would have comparatively little effect if it were the only means of their destruction. The natural enemies of insects do a tremendous work for the farmer, and these beneficial forms should be recognized and protected.

Perhaps the most common mistake made by teachers in connection with lessons on insects is in teaching the differences between moths and butterflies, and the stages in the development of these insects. The following will be helpful to those who have not the necessary knowledge for giving accurate information on this subject:

MOTHS AND BUTTERFLIES

The most important thing to remember in the study of moths and butterflies is that they appear in four different forms during their lives. These forms are the egg, the larva, the pupa, the adult.

The egg.— The eggs are laid singly or in clusters. They are usually found on the plant that is the favorite food of the young. The shining masses of the eggs of the tent caterpillar may be found on the twigs of apple and wild cherry trees.

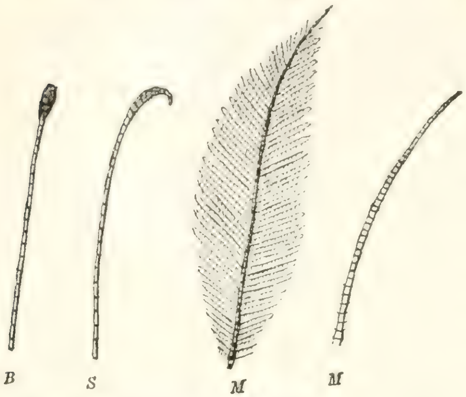
Moth *Butterfly*

The larva.—The larva, or "worm," hatches from the egg. During this period in its history the insect eats and grows. One of the most interesting things to notice in the study of larvæ, or caterpillars, is that as the insect grows it sheds its skin.

The pupa.— Of all the forms in which the moths and butterflies appear, the pupa is the strangest. Although this period in the life of the insect is spoken of as one of rest or sleep, it is the time when the most wonderful changes take place in its body. On this page are shown the chrysalids of a butterfly, the mourning cloak. When the caterpillars are about to shed their coats for the last time, they hang themselves head downward from a twig by means of a silken button, which they spin. Then they cast off their skins, leaving the chrysalids, or naked pupæ, hanging; they are protected from birds and

Chrysalids of the mourning-cloak butterfly

from many enemies, even from young naturalists, by their colors, which often closely resemble the support from which they are suspended.

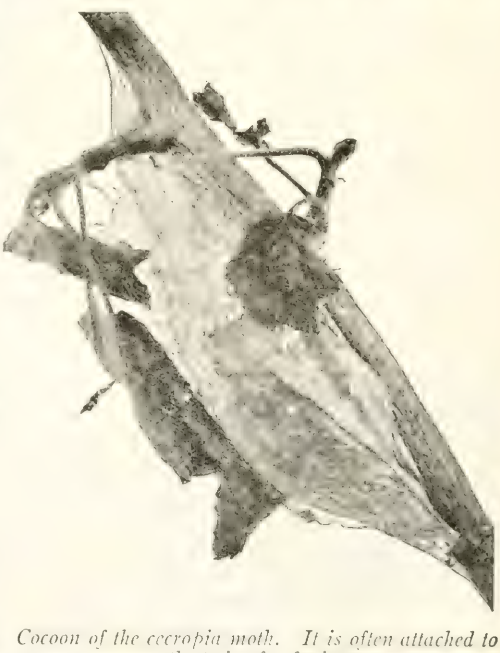


Antennæ, or feelers: B, of butterflies; S, of skippers; M, of moths

The pupa of a moth is nearly always inside a covering, which is called a cocoon. If a person examines carefully the fruit trees or the shade trees about his home, he may find a cocoon of the cecropia moth. This cocoon is made of silk and was spun by the larva of the giant silkworm as a protection against the storms of winter. The pupa is inside.

When studying pupæ it should be remembered that butterflies do not come out of cocoons. Their chrysalis, or pupa, is always naked. In the case of moths, however, the pupa is either protected inside a cocoon or by being either underground or in some well-sheltered place.

The adult.— The fourth period in the lives of moths and butterflies is spent in the adult form, and it will be well to learn the distinguishing characteristics of each.



Cocoon of the cecropia moth. It is often attached to the twig of a fruit tree

Butterflies have naked pupæ attached to a button of silk. They fly by day. The wings are held erect over the back when at rest. The antennæ, or feelers, have knobs on the apex. The body is slender.

Moths have pupæ protected either inside cocoons, or by being underground, or in some sheltered place. Many moths fly at night. The antennæ are threadlike or feathery, and never knobbed at the apex. The wings are folded flat along the back when at rest. The body is stout.

Occasionally insects will be found that very closely resemble butterflies, yet have some characteristics that are similar to those of moths. They are the skippers, so named because of their peculiar skipping method of flight. The antennæ have knobs, but these knobs are drawn out and turned back in the form of a hook. The body is rather stout. The pupa is sometimes covered by a thin cocoon. The wings are held vertically or horizontally when at rest.

Boys and girls often ask what they shall feed moths and butterflies. Many of the insects do not eat. Some sip the nectar of flowers or the sap of trees. Oftentimes they will drink sweetened water or the juice of fruit.

An excellent book, which will afford a background for instruction on insect life, and which would be a valuable addition to the school library or to the teacher's personal library, is *Insect Life*, by J. H. Comstock. (See page 1434)

ARE INSECT FOES INCREASING?

GLENN W. HERRICK

We often hear our fathers say:

" Why, I can remember when we didn't have any bugs to fight in this country. I can remember when there were no potato bugs, and when our cherries never had a worm in them, and when we used to get apples out of my father's orchard without a speck on them or a worm in them."

Are these statements true in fact, or are they largely based on memories made rosy by the passage of many years — memories of a boy who could eat Baldwins from the tree in June and wormy apples by the dozen and call them good?

Away out in western Texas in a branch of the Toyah Valley, a little valley following a beautiful stream between two magnificent spurs of the Davis Mountains, apples, pears, grapes, and alfalfa grew in their pristine abundance and perfectness a few years ago. Insect pests were unknown, and the apples and the pears were exceptionally large in size, perfectly free from knots or blemishes, and as smooth and shapely as the cheeks of a child. It was a new region, practically untouched by the disturbing elements of human civilization. So it was in the fruit sections of New York State when they were first planted, but conditions are certainly not the same to-day. It is safe to say that there are a dozen fruit pests in western New York to-day that were unnoticed or unknown thirty years ago. One has only to recall San José scale, blister mite and redbugs on apples, and grape root-worm, to be reminded of the truth of the foregoing state-

ment. It is interesting to note the manner in which some of these new pests have originated. It will help to answer the question, "Are insect foes increasing?"

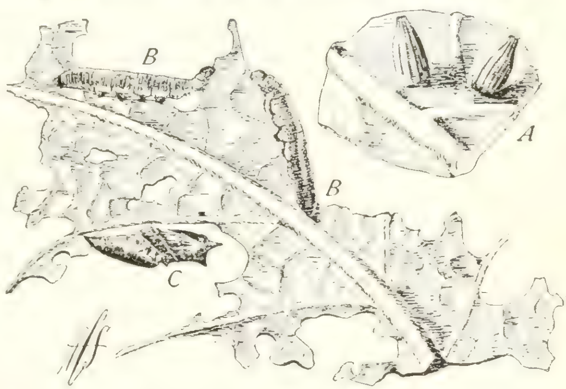
Larvæ of the gypsy moth

Out of seventy-three of our worst insect pests, thirty-seven, or over half of them, have been imported from foreign countries. The three worst pests now menacing the agricultural interests of the United States, namely, the gypsy moth, the brown-tail moth, and the Mexican cotton-boll weevil, are all comparatively recent importations from foreign countries. The gypsy moth was introduced into this country about 1869 by a French artist and naturalist who was carrying on some experiments at Medford, Massachusetts, in the production of silk. Some of the moths escaped from his cages, and from these the pest has gradually increased and spread until it has become a most serious enemy to the agricultural interests of New England. The brown-tail moth was probably introduced about 1890 on roses imported from France and Holland by a nursery in Somerville, Massachusetts. The Mexican cotton-boll weevil came into the United States about 1892 from its original feeding grounds in Mexico. The San José scale, the widely known pest of fruit trees; the codling moth, the parent of the ever present "worm" in apples; the Hessian fly in wheat; the common cabbage worm; the "green bug," or wheat louse; the angoumois grain moth; the croton bug and the buffalo moth in dwelling houses; and other common pests, many of them totally unknown to our fathers, may be cited as foreign insects that have entered this country and have become our most inveterate insect foes. But we cannot by any means impute all of our new insect troubles to the pests imported from other countries.

Full-grown codling moth larva burrowing in an apple

We are constantly and unwittingly creating troubles of our own of this kind. The Colorado potato beetle is an interesting and illuminating case in point.

Prior to 1850 the Colorado potato beetle was confined to the eastern slopes of the Rocky Mountains, notably in Colorado, where it fed on its wild food plant, the sand bur, a relative of the Irish potato. When the settlers began to cultivate the Irish potato in the West, the beetle spread from its original food plant, the sand bur, to the potato, on which it throve prodigiously. It had suddenly found a tender, succulent food plant, eminently suited to its taste and conveniently growing in large patches, extending from Colorado to the Atlantic seaboard and south to the Gulf of Mexico. Nothing was more inevitable than that this insect should gradually extend its territory to coincide with its newly found food plant. From 1868 to 1870 it entered New York State and has since remained as a pest with which we must contend yearly. Thus we find that insects once unknown as injurious suddenly become serious pests through the disturbing influences of man.



Parts of a cabbage leaf showing stages in the life history of the imported cabbage butterfly, with eggs at A, caterpillars at B, and chrysalis at C

The natural food plants of the common white grubs are the different grasses. In the pasture lands and in many of the older meadow areas of this country there will always be found more or less of these larvæ of the June bugs. When old pasture or meadow is plowed, and when corn is planted on the sod, injuries from white grubs are very likely to become serious. So long as the food plants of the June bug larvæ stand on the soil in abundance, the grubs will thrive and multiply, but their injuries may remain wholly unnoticed. On the other hand, when the grasses, standing thick on the ground, are destroyed by plowing, and corn is planted here and there instead, the ravages of the grubs often become prominent and widespread. The number of grubs remains practically the same, but the food plants are tremendously reduced in number; consequently the injuries become very much more noticeable and serious. It is simply another case in which man has unwittingly destroyed the balance in nature and brought troubles on his own shoulders.

Undoubtedly, insect foes are increasing. It is an inevitable result of the destruction of our forests and the bringing of much of the virgin soil under cultivation with the consequent disturbance of the normal conditions of insect life in those areas. It is the result also of the wholesale destruction of our birds for food, millinery purposes, and so-called sport; of increased population and wider occupation of the land by which many of the small animals that normally aid in holding insects in check have been driven away or destroyed; and of the importation of foreign plants and animals. In short, it is the inevitable result of the march of civilization by which general and profound disturbances of the forces that tend to hold the balance in nature have been brought about.

THE MONARCH BUTTERFLY

(For special study)

Anna Botsford Comstock

In September the monarch butterfly is rather common. It is easily distinguished from other butterflies by its brilliant copper-red color, its large size, and its slow, indolent, fearless flight. It shows by its every movement that it is not afraid of birds.

On the upper side, the central portion of each wing is brilliant copper-red; the veins are narrowly outlined in black; and the edges are bordered in black. The triangular tip of the front wing is black, spotted with pale orange. The black margins of the wings are set with a double row of white dots, two pairs between each two veins, and the edges are marked with white to correspond. Below, the front wings are copper-red on the hind margin covered by the lower wings, while the ground color of the hind wings and the tips of the front wings is buff; the veins are more strongly marked with black than on the upper sides, and the white dots in the black borders are large. The body is black with numerous white dots, especially on the underside. The antennæ are about two-thirds as long as the body, and each is tipped with a long knob. Sometimes an imprisoned butterfly will partake of nectar if flowers, such as petunias or nasturtiums, are put in its cage, and thus it may display its long sucking tongue; but if it refuses to do so, the tongue may be uncoiled by gently lifting it out with a pin. This butterfly really has six legs, although only four can be seen; the first pair is reduced in size and is folded under the head out of sight.

The male monarch has on one of the veins on the upper side of the hind wing a black spot, which makes that vein appear swollen. This is a little pocket filled with peculiarly shaped scales, which give off an odor too delicate for man's coarse senses to detect. This odor, however,

is supposed to be very attractive in butterfly circles and helps him to win his mate.

The monarch in all of its stages is distasteful to birds. The reason for this is not known, but the fact is. There is a similar butterfly in nowise related to the monarch, which has assumed the monarch's colors and markings. This resemblance is so close that the disguised butterfly is avoided by the birds, although its relatives are regarded as delicate tidbits by all insect-eating birds. This butterfly is called the viceroy. (See article on the sovereign butterflies, page 1262.)

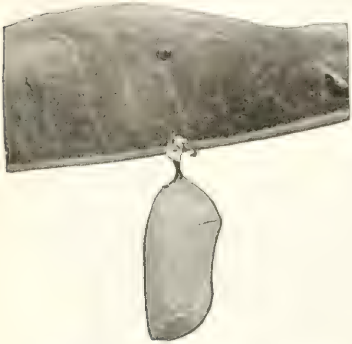
Monarch butterfly

The monarch is a native of tropical America, and every year it comes north with the spring and the warm weather. As soon as the milkweed appears, the monarch butterfly appears also, and the female lays her eggs on its leaves. From these eggs hatch the monarch caterpillars. One of them when fully grown is a striking object; its ground color is green with cross stripes of yellow and black. On the second segment back of the head are two long, slender organs, like whiplashes, and near the end of the abdomen is a similar, but shorter pair. If the caterpillar is disturbed, the front pair of whiplashes twitches warningly; when the caterpillar walks, they move back and forth. These whiplash filaments are probably used to frighten away the parasitic flies that attack the caterpillar.

The caterpillars feed only on the milkweed, which they eat industriously day and night, except during a few moments of rest now and then. As the milkweed leaves are very succulent, the caterpillars may attain their growth in eleven days, meantime, like all other insects, shedding their skeleton skins to allow for further growth.

When fully grown the caterpillar hangs itself by the tip end of its body and sheds its last caterpillar skin. A most marvelous transformation has meanwhile taken place; now it is a little, oblong object of exquisite delicate green, ornamented with flecks and tubercles and dots of gold. There is a band of gold across the third segment of the abdomen, the lower edge of which is dotted with black. The chrysalis is attached by a little black knob ending in hooks to a button of silk, spun by the caterpillar for this purpose. After a few days the chrysalis changes to a darker

and more bluish green; and as the time nears for the butterfly to emerge, the hue becomes darker and duller. About twelve days after the chrysalis is formed, the butterfly emerges. At first its wings are very much crumpled from being confined in so small a space, but soon they expand in all their beauty; and a new monarch drifts lazily and confidently off into the world.



Chrysalis of the monarch butterfly

OBSERVATIONS FOR PUPILS

The adult

1. How can you tell the monarch butterfly from other butterflies when you see it flying? How does it compare in size with any other copper-colored butterfly? What is peculiar about its flight? Notice whether it flaps its wings often or seems afraid.

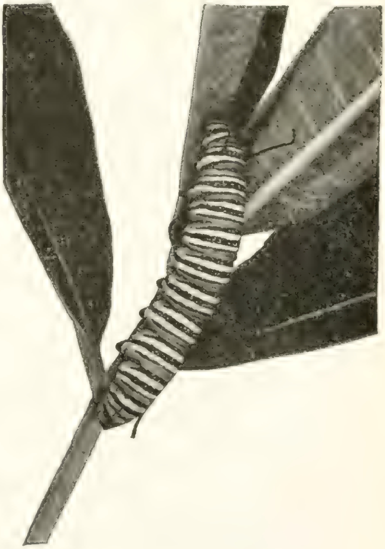
2. How many colors does the monarch butterfly show on the upper side of its wings? Make a sketch or describe the part that is copper-red, the parts that are black, and where the white appears. Can you see white marks on the edges of the wings?

3. Is there any copper-red on the lower side of the wings? What is the general color of the wings below? How are the white spots arranged on the lower side of the front wings?

4. What colors do you find on the monarch's body? Sketch or describe the antennæ and the eyes.

5. If you have a captive butterfly, bring in bouquets of nasturtiums or salvia and place the butterfly on them. Describe how it reaches the nectar. Can you see the butterfly's tongue coiled up underneath the head? How long is it when uncoiled?

6. How many legs has the monarch? How many legs have insects in general? Do you think, then, that the monarch is not an insect?



Larva of the monarch butterfly

7. Look at the monarch butterfly and note whether there is on the upper side of each hind wing a long, black spot near one of the veins. What is this for? Are these spots on all monarch butterflies?

8. Do you know why the striking colors of the monarch butterfly are an advantage to it? Do you know the viceroy butterfly, which closely resembles the monarch? What advantage is this to the viceroy?

The caterpillar

9. On what plant does the monarch caterpillar feed? Do you find it on the upper or lower side of the leaves? Do you think the mother butterfly laid her eggs, which later hatched into the caterpillars, on the milkweed plant?

10. How many colors do you find on the caterpillar? How are these colors arranged?

11. Can you see some little filaments like whiplashes on the caterpillar? On which segments are they? Which pair is the longer, the front or the hind pair? If you touch the caterpillar, which pair twitches the more excitedly? Of what use do you think these little living whips are to the caterpillar?

12. Describe how the caterpillar eats the milkweed leaf. Does it eat constantly, or does it now and then rest?

13. Watch the caterpillar; then describe how it sheds its skin. Why does it shed its skin?

The chrysalis

14. When the caterpillar is fully grown and is ready to change to a chrysalis, how does it hang itself up? Describe how it sheds its skin.

15. Describe the shape of the chrysalis. What is its color? How is it ornamented?

16. Watch the colors of the chrysalis day by day and note whether they change. Do the markings change?

17. How does the butterfly get out of the chrysalis? How does it look when it first comes out? How does it act at first? How does the empty chrysalis look?

TO A BUTTERFLY

Birds have their nests; they rear their eager young
And flit on errands all the livelong day;
Each field mouse keeps the homestead where it sprung;
But thou art nature's freeman — free to stray
Unfettered through the wood,
Seeking thine airy food,
The sweetness spiced on every blossomed spray.

T. W. HIGGINSON

THE SOVEREIGN BUTTERFLIES

(For special study)

ANNA BOTSFORD COMSTOCK

There are three sovereign butterflies found in New York State, but only two are common. They are large butterflies with rounded wings.

Red-spotted purple

The red-spotted purple.—The red-spotted purple has velvety black wings. The front wings are reddish at the tips, and the hind ones show a dark metallic green luster, while the triple rows of spots near the edges may be green, blue, or purple. This species is found only in the southern part of the State and is not very common.

The banded purple.—The banded purple, or the white admiral as it is usually called, has chocolate-black velvety wings with a broad white band crossing both front and hind pairs. This is a common butterfly throughout New York State.

The viceroy.—The viceroy has quite forsaken the general coloring of its family and appears in a uniform of brilliant orange-red with veins and borders black, in imitation of the monarch. Since the monarch is avoided by birds, it is much to the viceroy's advantage to resemble the monarch as closely as possible, and the imitation is very perfect, except that the viceroy has a narrow black band across the middle of the hind wings.

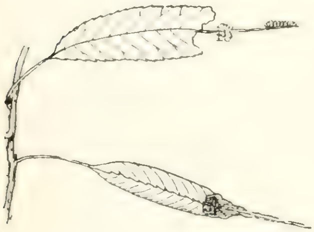
Banded purple, or white admiral

The habits of the caterpillars of the sovereigns are very much alike and are very interesting. There are two broods each year. The egg of the first brood is laid by the adult female at the tip of the leaf of the food plant, which in the case of the white admiral is black birch or poplar, in the case of the viceroy willow or poplar. The newly hatched caterpillar feeds across the end of the leaf, leaving the midrib. It rests on the naked midrib during the day and feeds at night. Soon it makes a

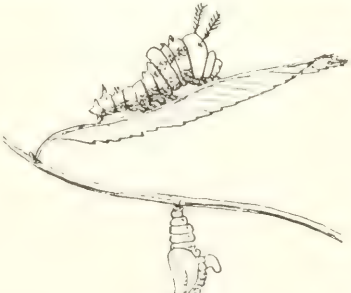
bundle out of bits of the leaf and fastens this to the midrib near the uneaten part. It moves this bundle down as fast as it eats the leaf. At first it is a slender, warty, little caterpillar, but as it grows and sheds its skin, it becomes humpbacked and is ornamented with spines. The second large segment back of the head bears two tall branched spines. The caterpillar is a formidable looking creature, and when it finally changes to a chyrsalis, it has a large excrescence in front, which looks like a Roman nose. It requires about a month from the time the egg is laid for the insect to develop into its winged, or adult, form.

Viceroy above, monarch below, showing relative sizes and imitative coloring

The story of the second brood is very different and is one of the mysterious happenings of the insect world. When the caterpillar of the second brood hatches, it feeds, as did its parents,



Larva and partly eaten leaf, above. Winter home of second-brood larva, below



Larva and chrysalis of sovereign butterfly

on the tip of the leaf; but when it is about half-grown, it selects a leaf and fastens the petiole to the twig with silk. It then gnaws the tip of

the leaf squarely off, leaving the midrib bare, folds the remaining portion of the leaf into a tube, fastens it, and lines it with silk. Into this little house, which is just large enough to accommodate its body, the caterpillar crawls, its last warty segment making a closed door to the opening. There it remains safe during the winter and does not come out until spring spreads a feast of fresh leaves on the tree, on which it can feed and complete its growth. The interesting question concerning this winter habit of the sovereign caterpillars is, how do they know when and how to make a winter house? They never experienced a winter, and their parents never experienced a winter, yet they often make their winter houses during the warm days of autumn.

BITING AND SUCKING INSECTS

Glenn W. Herrick

Name of insect	Mouth parts
European praying mantis	Biting
Peach-tree borer	Larva, biting; adult, sucking
Cherry maggots	Larvæ, biting; adults, sucking
Apple-leaf aphis	Sucking
San José scale	Sucking
Imported currant worm	Biting
Apple-tree tent caterpillar	Larva, biting; adult, sucking

THE EUROPEAN PRAYING MANTIS

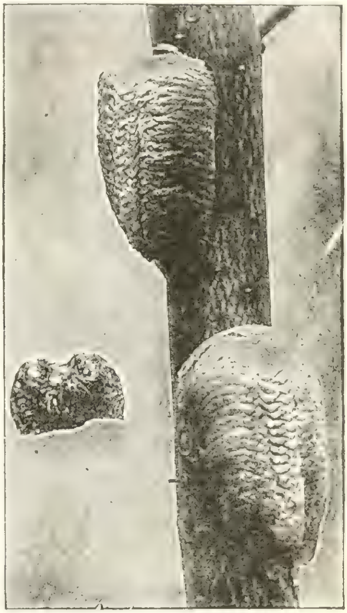
Mantis religiosa

(A beneficial insect)

Many of the worst insect pests have come from foreign countries. It seems to be an easy matter for these injurious species to find their way into this country, but exceedingly hard for beneficial insects to be introduced. A notable instance, however, of a beneficial insect being accidentally introduced is that of the European praying mantis. In 1899 this insect was found near Rochester, New York, and now it seems to be fairly widely distributed in the central part of the State. The praying mantis is common in southern Europe, especially in France. It is also found in Asia and in parts of Africa. It probably came into New York State on nursery stock imported from Europe.

Appearance of the insect.—The mantis is a slender green insect two and one-half inches in length. Its most characteristic feature is the long slender portion of the body just behind the head, known as the prothorax, which bears the front pair of peculiarly formed legs. These legs are fitted for seizing and holding other insects, which constitute the food of the mantis.

While the insect is at rest, the front legs are held up in the attitude of prayer, "but the only prayer that could ever enter the mind of a mantis would be that some unwary insect might come near enough for him to grab it with his hypocritical claws and so get a meal." The appearance of the insect is well shown in the illustration taken several years ago by Professor Slingerland.



Two egg cases of the praying mantis

Story of its life.—The eggs of the mantis are laid in a large thick light brown mass, known as an egg case, or ootheca. Two of these egg cases are shown in the accompanying illustration. They are often found attached to branches of trees, stems of grasses, or the sides of houses during the winter, for the eggs are laid in the fall and remain unhatched until the following spring. During the last of May or the fore part of June the eggs hatch. The young mantes grow slowly, gradually acquire wings, and finally become adults during the first part of August. There is but one generation a year, and probably many of the nymphs that hatch from a single egg case die before they ever become fully grown.

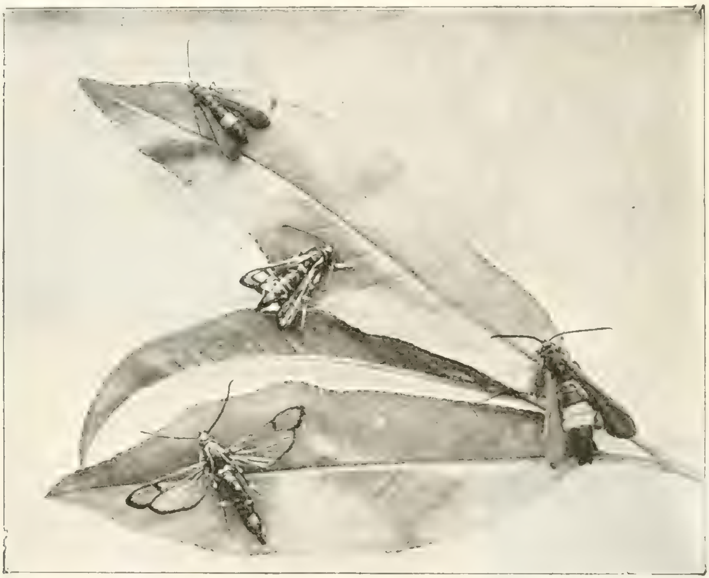
Adult praying mantis

The habits and the usefulness of this insect.—The praying mantis belongs to the same group of insects as do the grasshoppers and the crickets. It, therefore, has biting mouth-parts but does not eat plants. Its food consists almost wholly of other insects, many of which are serious pests of farm crops. The praying mantis, therefore, is a great aid to man in fighting insect enemies and is entitled to respect and protection. Its movements are slow and deliberate, and, when its prey is sighted, it often "creeps up silently much like a cat, and when close enough makes a quick dash, seizing its prey with its spined forelegs." It is very voracious and eats several insects each day if it has the good luck to find them.

THE PEACH-TREE BORER

Sanninoidea exitiosa

Appearance of the insect.—The mother of the peach-tree borer is a handsome moth, with a wing expanse of a little more than an inch, steel-blue in color with a single or a double orange-yellow band around the abdomen. The fore wings are covered with steel-blue scales, but the hind wings are largely transparent. All four wings of the male moth are transparent. The borer, or the larva of this moth, is a whitish caterpillar about one inch long when full-grown.



Adult moths of the peach-tree borer, natural size. The upper one and the one at the right are females

Story of its life.—The female moth deposits her tiny eggs on the trunk of a peach tree in July and August. They hatch, and the small larvæ go down the trunk to the ground where they gnaw their way into the inner bark and sapwood of the tree. They become partly grown by fall and pass the winter either in their burrows beneath the bark or in silken coverings made for protection during this inactive period. In the spring they become active and complete their growth during June and July. Each larva when full-grown, forms a rough brown elongated cocoon made of silk with bits of bark and waste materials entangled in it. The cocoons are placed at the base of the tree at or near the surface of the ground. After three

or four weeks the moth emerges from the cocoon. There is one generation a year.

Injury and control.—The larvæ injure the peach trees by eating out burrows partly in the inner bark and partly in the sapwood just below the surface of the ground at the bases of the trunks and on the larger roots. Large quantities of gum exude from the injured trees.

Peach-tree borers

The general method of control is to dig the borers out by hand with a knife. This is sometimes done in the fall, but more usually in the spring. The borers are larger and more easily seen in the spring, but they should be dug out before the middle of June. Mounding the trees with soil to the height of eight or ten inches after the borers have been dug out in the spring, seems to protect the trees considerably.

Within the last year, it has been shown that a tree can be very effectively protected from borers by fitting a piece of tarred paper, properly cut, tightly about the base of the trunk. These mechanical protectors are now being manufactured on a commercial scale and can be bought on the market.

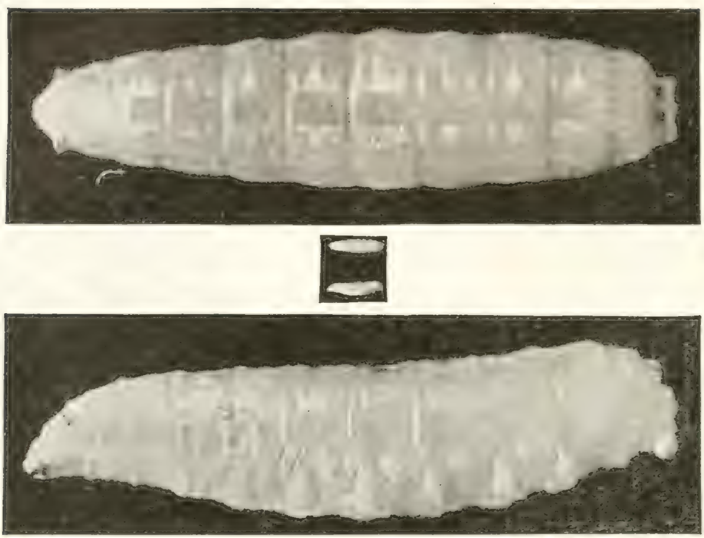
Cocoons of peach-tree borers, natural size

Several protective washes have been tried for the prevention of this pest, but none of them have proved wholly satisfactory. Gas tar has been used in some cases with good effect, while in other instances it has injured and killed the trees to which it was applied. It should be painted on the trunks of the trees to the height of from eighteen inches to two feet and should extend three or four inches below the surface of the earth. It should not be applied to unhealthy trees, nor to trees less than two years old, nor should it be used in the fall. If applied in the spring to healthy trees while growth is active, there is least danger of injury.

THE CHERRY MAGGOTS

Rhagoletis cingulata

Rhagoletis fausta



Upper and side views of maggot of the cherry fly. Natural size and much enlarged

Appearance of the insects.—There are two kinds of flies that lay their eggs in cherries in New York State and cause maggots in the fruit. Both of them are much alike in appearance. They are smaller than the house fly, and their wings are crossed with dark bands. In one species there is a small clear circular spot on each wing that looks like a bullet hole. The maggots are yellowish white, straight, and about one-fourth of an inch in length. The larva of the plum curculio, which is also found in cherries, is larger and assumes a more or less curved attitude in the fruit.

Story of their lives.—The life histories of the flies are very similar. They begin to deposit their eggs in the cherries in June, just about the time that the fruits are reddening. The eggs soon hatch, and the maggots live in the cherries for three or four weeks. When full-grown the maggots drop to the ground and burrow into it to the depth of about one inch. Here they change to brownish oval objects called puparia, and remain until the following June. There is thus but one generation a year.

Injury and control.—The best looking cherries may contain maggots although no outward sign of their presence can be seen. The infested

Female fly of cherry maggot, Rhagoletis fausta, natural size and enlarged

Adult fly of cherry maggot, Rhagoletis cingulata, natural size and enlarged, with wings spread and in the normal position when the fly is at rest. The enlarged wing below illustrates a variation in the markings

cherries remain hanging on the tree and ripen, but they finally sink in on one side and decay. Sweet as well as sour cherries are attacked.

These flies may be controlled by lightly spraying the foliage of the lower limbs, or of all the branches if desired, with arsenate of lead, at the rate of 5 pounds to 100 gallons of water, which has been sweetened by the addition of 3 gallons of cheap molasses. A pint of this material is sufficient for a medium-sized tree. The flies suck up the sweetened drops of liquid and are killed before they lay their eggs if the spraying is done just before the fruit begins to redden. If the sweetened poison is washed off by rain, another application should be made.

THE APPLE-LEAF APHIS

Aphis pomi

Winter eggs of apple-leaf aphis

Appearance of the insect.—There are three species of plant lice that are found on the apple tree in considerable numbers, two of which are often very injurious both to the fruit and to the foliage. One of these is the apple-leaf aphis, a species found in this country since 1897. It was imported from Europe, probably on nursery stock, and is now widely distributed.

The body of the insect is pear-shaped, bright green in color, and the aphides of the first generation found on the opening buds in the spring are wingless. The second generation of aphides usually contains a large proportion of winged forms, which fly to other parts of the same tree or to other trees where a new colony is produced. The aphides live all the year on the apple tree.

Young aphides

Story of its life.—In the fall the true mother aphis deposits small black shining eggs on the bark of the smaller twigs, especially on the suckers. The eggs remain on the tree all winter and hatch in the spring as the buds begin to break. Generation after generation of the aphides are produced throughout the summer on the apple tree. Many of the aphides of these generations are wingless; but usually some of each generation, especially of the later ones, are born with wings. In October,

however, the true mother aphides, which are always without wings, are produced; these deposit the eggs, thus completing the life cycle.

Injury and control.—The aphides suck the juices from the leaves and cause them to curl and remain small and stunted. They also prevent the young twigs from making their regular amount of growth. Moreover, the fruit itself is dwarfed and deformed through the presence of the aphides.

These plant lice are very hard to control. They must be hit with some substance that will kill them, for they cannot be poisoned. Moreover, they must be hit before they become hidden within the curled leaves. Therefore, the spraying must be done early. The most effective method of control so far devised is to hit the lice on the opening buds with " black leaf 40 " and soap just after the lice have hatched from the eggs. "Black leaf 40 " is a tobacco extract and should be used at the rate of $\frac{3}{4}$ of a pint or a pint to every 100 gallons of water. To this mixture should be added 4 or 5 pounds of whale-oil soap or good laundry soap. The soap aids the material in sticking and spreading, thus making it more effective. When the trees are badly infested a second application may well be made just after the petals have fallen from the blossoms.

THE SAN JOSÉ SCALE

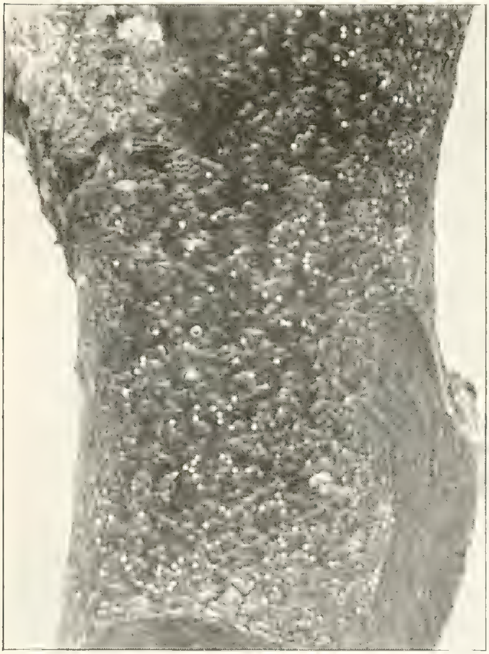
Aspidiotus perniciosus

Appearance of the insect.— The San José scale is a very small insect about the size of the head of a pin. The body is soft, yellowish white, and wholly hidden beneath a grayish, waxy scale. The scale is circular in outline and somewhat conical in shape with a fine point at the apex often surrounded by a grayish ring. In fact the scale, when magnified, resembles a small, low, circular mound. It serves as a fine protective covering for the insect beneath. When a peach twig is infested with a multitude of these scales, it looks as though it were covered with a layer of ash-gray scurf.

Story of its life.— The San José scale passes the winter in a partly grown condition on the branches of the plants that it infests. The scale that covers the body in the winter is dark brown or very nearly black and smaller than when the insect is full-grown. In the spring, when the plant starts growth, the insect grows rapidly and usually becomes mature in June. The young are then produced in great numbers. The young insects look like tiny mites as they crawl about over the branches in search of a place to settle down and insert their tiny beaks into the bark. After a few hours each one settles and begins to secrete its waxy scale. In the course of forty to forty-five days they become full-grown, and another generation is born. There may be three or four generations in New York

in a season. The last generation passes the winter on the branches in a partly grown condition.

Injury and control.— Each scale insect has a long, slender, threadlike proboscis, which it thrusts through the bark down to the sappy layers just beneath. It then begins to pump the sap of the tree into its small yet always hungry body. When a tree becomes covered with untold numbers of these tiny insects, they deprive it of all of its nutritious sap and finally literally starve the tree by stealing its food.



San José scale

The San José scale may be controlled by spraying the infested trees with lime-sulfur during the dormant period, preferably late in the spring just before the buds start. Severely infested trees may need to have two sprayings, one in the autumn after the leaves fall and another in the spring. The spraying should be done thoroughly and with care and intelligence.

THE IMPORTED CURRANT WORM

Pteronus ribesii

Appearance of the insect.— The mother insect of the imported currant worm is a wasplike sawfly about one-third of an inch in length, with four clear wings, a dark head and thorax, and a reddish yellow abdomen. The worms, or larvæ, are about three-fourths of an inch in length when full-grown, and green in color with each end of the body tinged with yellow. The younger larvæ are green but spotted with black dots.

Story of its life.— The adult sawflies appear early in the spring and deposit their conspicuous white eggs along the principal veins on the undersides of the currant leaves. The eggs hatch in a week or ten days, and the larvæ eat holes in the leaves and become full-grown in two or three weeks. They then go into the ground or beneath rubbish on the surface of the earth and spin cocoons, within which they change to pupæ. The adults appear in late June or early July and deposit eggs for a second

brood of larvæ, which are often more numerous than those of the first brood. The larvæ of the second brood remain in their cocoons until the following spring. There may, in favorable seasons, be a small third brood.

Injury and control.— The larvæ eat the currant leaves, and, if abundant, defoliate the currant bushes in a short time.

They may be controlled by spraying the bushes early in the spring with arsenate of lead, 2 pounds to 50 gallons of water. Later, as the fruit begins to ripen, the bushes may be dusted with fresh white hellebore, 1 pound in 5 pounds of flour or air-slaked lime.

Larvæ of the imported currant worm

Eggs of the imported currant worm

THE APPLE-TREE TENT CATERPILLAR

Malacosoma americana

Appearance of the insect.— The mother moth of the apple-tree tent caterpillar is dull yellowish or reddish brown, with two whitish or pale yellow stripes across each wing. The caterpillars, or larvæ, are two inches or more in length, and are velvety brown spotted with purple and yellow and have a whitish line the whole length of the back. They are also more or less clothed with long, yellowish hairs (see figure).

Story of its life.— The mother moth deposits her eggs in a ringlike mass around the smaller twigs of a tree, and covers them with a firm cement, like varnish, which holds the eggs in place and keeps out the rain. Here

Adult moth of the apple-tree tent caterpillar

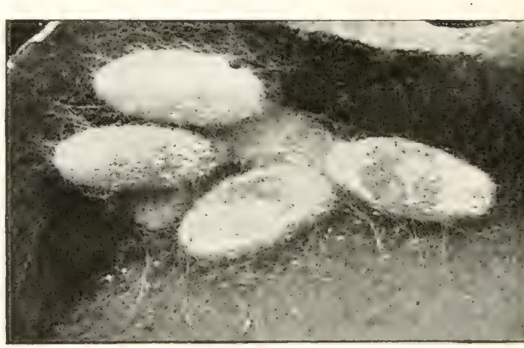
the eggs remain all winter, and hatch in the spring about as soon as the buds burst. The caterpillars eat the buds and the leaves, grow very fast, and by the first week in June become mature. Each one then finds a nook or a cranny in which to spin a thick, silken cocoon, covered with a yellowish powder. Inside of the cocoon the caterpillar changes to a pupa, which transforms to a moth in the latter part of June. The moths soon deposit their ring-like masses of eggs; then they die.

Egg mass of the apple-tree tent caterpillar

Injury and control.— The moths do no harm, but the caterpillars eat the buds and the leaves and defoliate the trees. This weakens the trees, stops the new growth, and prevents the production of fruit.

The insect can be controlled by collecting the egg rings during the fall and winter (page 1252), and by spraying the trees with arsenate of lead, 3 pounds to 50 gallons of water, once after the leaves appear but before the blossoms open, and again after the petals fall.

Apple-tree tent caterpillars



Cocoons of the apple-tree tent caterpillar

INSECTS TO BE RECOGNIZED IN 1915-1916

THE GRASSHOPPER

ANNA BOTSFORD COMSTOCK

For schoolroom study it is best to place a grasshopper in a tumbler on a spray of fresh herbage, and allow the pupils to observe it at leisure.

The grasshopper earns its name by its powerful jumping, and it performs its jump after the most approved athletic methods. The long hind legs are folded together parallel with the insect's body, and the entire foot, with a spine in the heel, is pressed to the ground. Then, like a steel spring, the long legs straighten, and the insect makes a jump that, translated into human terms, would be equal to a man making a standing jump of five hundred feet. Of course this is an excellent method for the grasshopper to escape its enemies, such as birds, skunks, and other animals.

The grasshopper's face has a most comical expression. It is a long face, with the compound eyes placed high on it; and in front of each big eye, and between and below them, are the three tiny simple eyes. The antennæ are short, but alert. There are two pairs of jaws, which move sidewise, and connected with these are the palpi, or feelers, which continually tap the food while the insect is eating.

Back of the head is a sunbonnet-shaped piece, bent down at the sides, which forms a cover for the middle part of the body, called the thorax. To the thorax are attached the three pairs of legs, the wings, and the wing covers. The wing covers are not meant for flying, but are held stiff and straight up in the air during flight. The true wings when at rest are folded lengthwise, like a fan, beneath the wing covers. They are strongly veined and circular, and are capable of either short, swift flights, or long-continued flights when the insects are in hordes and migrate into new territory.

The abdomen consists of rings, as in all insects, and along the lower sides there are two lengthwise creases, which open and shut when the grasshopper breathes. The spiracles, or breathing pores, can be seen on each segment, just above this suture. The ears are two large disks, one on each side of the first segment of the abdomen, and can be seen by lifting the wings. The long-horned grasshoppers have their ears in the front elbow, like the katydid.

In the fall grasshoppers lay their eggs in oval masses protected by a tough covering in the ground or in decaying wood. The eggs hatch early in the spring, and the young are therefore ready to attack the tender crops.

WASPS

ANNA BOTSFORD COMSTOCK

The wasps and the bees are near relatives; many unobserving persons do not know them apart. The writer had some polite neighbors once who came to her and told her apologetically that her bees had swarmed into their kitchen and were helping themselves to preserves that were being made. She hastened to the besieged kitchen and found that the neighbors did not know bees from yellow jackets, for there were only wasps taking toll of preserves in that kitchen. Yet honeybees and yellow jackets are very unlike. The bee is fuzzy and broad-waisted, while the yellow jacket is polished and narrow-waisted. However, the feature by which entomologists always distinguish bees from wasps is the pollen basket with which the bee is provided on each of her hind legs. Wasps never have these baskets.

Yellow jacket and nest

There are many kinds of wasps. In general they belong to two groups, the solitary and the social.

The solitary wasps.— The solitary wasps are so called because each family lives by itself; that is, the mother wasp makes a nest for her young in the spring, and only the members of one family grow up together. The mud daubers, the mason wasps, the carpenter wasps, and the digger wasps are all solitary. Their wings when closed lie folded across the back.

The mud dauber may be used to illustrate the habits of the solitary wasps. The female is a black slender creature with blue-purple, iridescent wings, and is very common in New York State. She builds her nest of mud, which she finds in puddles and on muddy roadsides. She collects a pellet of mud in her jaws and by mixing it with saliva changes it to cement. She plasters these soft pellets under the roof boards of some shed or garret. She has to make many trips in building a cell, which needs to be an inch long and perhaps a half inch in width. The walls are about one-eighth of an inch thick; and, while the outside may be rough, the inside is very smooth. When one of these tubes is finished except for an opening left at one end, the mud dauber changes her labors and starts off spider hunting. As soon as she sees a spider hanging snugly in its web, she pounces down on it and stings it at just the right place in its nervous system to paralyze it but not to kill it. In her jaws she carries the helpless spider

to her nest and packs it into the far end. She captures more spiders and packs them away until the nest is fairly full; then she lays her egg in the cell and walls it up — spiders, egg, and all. From the egg hatches a white grub, for the young of all wasps are grublike creatures. The little grub starts in at once to eat the helpless spiders and eats heartily, like most young creatures, until it has devoured all the spider meat so miraculously preserved for its use. It then changes to a pupa, and later changes to a wasp and gnaws its way out into the world.

A mason wasp

The mason wasps build jug-shaped nests fastened to twigs, and provision them with caterpillars. The digger wasps make holes in the ground for their nests and provision them with caterpillars or grasshoppers. The carpenter wasps excavate tunnels in deadwood or in the pith of shrubs and use various insects for the food of their young. There are many solitary wasps that use any cavity which they happen to find already made, but they all have the peculiar way of preserving the insect meat fresh for the food of their young. The sting of the solitary wasps gives a person little pain and is very different from the sting of a yellow jacket.

The mud daubers, solitary wasps

The social wasps.—The social wasps also are divided into many species and include those known as yellow jackets and hornets — a large species being the white-faced black hornet, much feared even by brave boys. The social wasps fold their wings peculiarly; each wing is folded lengthwise, like a fan, and extends down on each side of the body when at rest, instead of being closed above the back as is the case with the solitary wasps and the bees.

The story of the yellow jacket will illustrate the habits of all the social wasps. The queen mother survives the winter in some protected place, and in the spring builds

a little nest of paper. She bites off bits of wood and chews them into a pulp, and with this material she makes several cells and surrounds them with a protecting envelope. She lays an egg in each cell; these eggs hatch into little white grubs, which she feeds dutifully at first with partially digested food from her own stomach and then with any food that she happens to find which is acceptable to them. Thus they gain their growth, and each spins a little veil over its cell, changes to a pupa, and later emerges as a full-grown worker ready for business. These workers at once assume all the duties of the queen except that of laying eggs. They enlarge the nest and feed the young and protect the nest from enemies.

Often one of these wasp nests will show several combs, one below the other. They differ from the combs in a beehive in the following respects: they are made of paper instead of wax; the cells open only on the lower side; they are not used for storing honey, but merely as cradles for the young wasps. It is interesting to see one of these combs with each cell filled to its utmost with a chubby little grub that has a head like a drop of amber honey—a head that is always protruding from the cell in order to attract the attention of the worker nurses when they bring in food. One might suppose that, hanging head down, these legless creatures would fall out of the nest; but nature has provided each with a sticky disk at the end of the body which holds it fast in the cell.

Usually a yellow jacket's nest is inhabited for one year only. All the inmates die off in the fall except a queen, which was developed late in the fall. However, the writer has heard of one or two instances when a clever young queen took advantage of the old nest and used it for a second summer.

Although wasps are fond of sweets, their chief food consists of insects, and usually the insects that can best be spared, for they destroy many flies, mosquitoes, and injurious caterpillars.

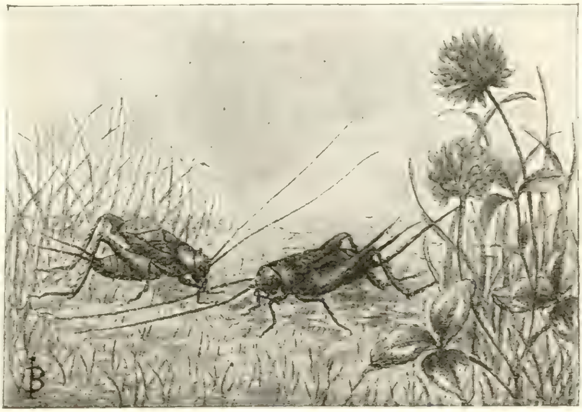
THE BLACK CRICKET

Anna Botsford Comstock

The haunts of the cricket are usually sunny; it digs a little cave beneath a stone or a clod in some field, where it can have the whole benefit of all the sunshine when it issues from its door. The black cricket cannot fly, since it has no wings under its wing covers as have the grasshoppers. The hind legs have a strong femur, and a short but strong tibia with downward-slanting spines along the hind edge, which undoubtedly help the insect in scrambling through the grass. At the end of the tibia, next to the foot, is a rosette of five spines, the two longer ones slanting to

meet the foot; these spines give the insect a firm hold when making ready for its spring. When walking, the cricket places the whole hind foot flat on the ground, but rests only on the claw and the segment next to it of the front pairs of feet. The claws have no pads like those of the katydid or the grasshopper; the segment of the tarsus next the claw has long spines on the hind feet and shorter spines on the middle and the front feet, thus showing that the feet are not made for climbing but for scrambling along the ground. When getting ready to jump, the cricket crouches so that the tibia and the femur of the hind legs are shut together and almost on the ground. The dynamics of the cricket's leap are well worth studying.

The patent-leather finish of the cricket's clothes is of great use; for, although the cricket is an efficient jumper, it is, after all, mostly by running between grass blades that it escapes its enemies. If a person tries to catch one, he realizes how slippery it is, and how efficiently it is able to slide through the fingers.



Black crickets

The cricket's features are not very easily made out, because the head is polished and black; the compound eyes are not so polished as the head, and the simple eyes are present but are discerned with difficulty. The antennæ are longer than the body and are very active; there is a globular segment where they join the face. The lens reveals that the flexibility of the antennæ is due to the fact that they are many-jointed. The palpi are easily seen, a large pair above and a smaller pair beneath the "chin." The palpi are used for testing food and in order to prove whether it be palatable. The crickets are fond of melons and other sweet, juicy fruits, and by putting such food into the cage the insects can be seen biting out pieces with their sidewise-working jaws, chewing the toothsome morsels with gusto. They take hold of the substance they are eating with the front feet, as if to make sure of it.

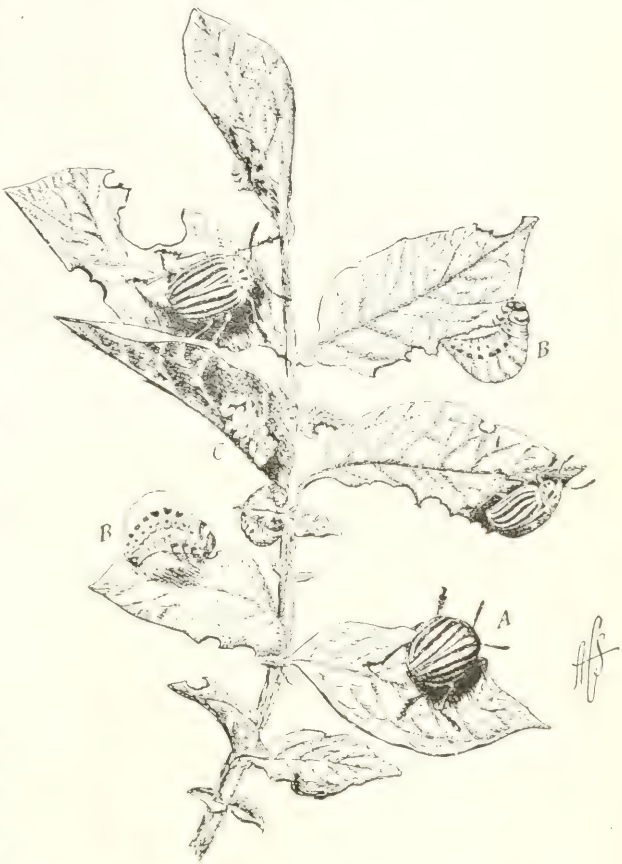
The wing covers of the cricket are bent down at the sides at right angles, like a box cover. The wing covers are much shorter than the

abdomen, and beneath them are vestiges of wings, which are never used. The male has larger wing covers than the female, and they are veined in a peculiar scroll pattern. This veining seems to be a framework for the purpose of making a sounding board of the wing membrane, by stretching it out as a drumhead is stretched. Near the base of the wing cover there is a heavy cross vein covered with transverse ridges, which is called the file; on the inner edge of the same wing, near the base, is a hardened part called the scraper. When he makes his cry, the cricket lifts his wing covers at an angle of forty-five degrees and draws the scraper of the under wing against the file of the overlapping one; lest his musical apparatus become worn out, he can change by putting the other wing cover above. The wing covers are excellent sounding boards, and they quiver as the note is made, setting the air in vibration and sending the sound a long distance. The wing covers of the female cricket are more normal in venation. The female may always be distinguished from her spouse by the long, swordlike ovipositor at the end of her body; this she thrusts into the ground when she lays her eggs, thus placing them where they will remain safely protected during the winter. Both sexes have a pair of "tail feathers," as the children call them, which are known as the cerci (singular, cercus) and are fleshy prongs at the end of the abdomen.

There would be no use of the cricket's playing his mandolin if there were not an appreciative ear to listen to his music. This ear is placed most conveniently in the tibia of the front leg, so that the crickets literally hear with their elbows, as do the katydids and the meadow grasshoppers. The ear is easily seen with the naked eye as a little, white, disklike spot.

The chirp of the cricket is, in literature, usually associated with the coming of autumn; but the careful listener may hear it in early summer, although the song is not then so insistent as later in the season. The cricket usually commences singing in the afternoon and keeps it up periodically all night. The writer has always been an admirer of the manly, dignified methods of this little "minnesinger," who does not wander abroad to seek his lady love but stands sturdily at his own gate, playing his mandolin the best he is able; he has faith that his sable sweetheart is not far away, and that if she likes his song she will come to him of her own free will. The cricket is ever a lover of warmth, and his mandolin gets out of tune soon after the evenings become frosty. He is a jealous musician. When he hears the note of a rival, he at once bristles up, lifting his wings at a higher angle and giving off a sharp militant note. If the two rivals come in sight of each other, there is a fierce duel. They rush at each other with wide open jaws, and fight until one is conquered and retreats, often minus an antenna, a cercus, or even a leg.

A cricket cage for schoolroom study may be made in the following manner: Plant in a small flowerpot a root of fresh grass or clover. Place over this and press well into the soil a lantern or lamp chimney. Cover the top with mosquito netting. Place the pot in its saucer, so that it may be watered by keeping the saucer filled. Ask the pupils to collect some crickets. In each cage place a male and one or more females, the latter being readily distinguished by the long ovipositors. Place the cages in a sunny window, where the pupils may observe them at recess. In studying the cricket closely, it may be well to put one in a vial and pass it around. In observing the crickets eat, it is well to give them a piece of sweet apple or melon rind, as they are very fond of pulpy fruits.



Potato stalk with beetles at work: A, beetle; B, grub, or slug; C, eggs

THE COLORADO POTATO BEETLE

Leptinotarsa decemlineata

GLENN W. HERRICK

Appearance of the beetle. — The Colorado potato beetle is a robust-looking insect nearly half an inch long, with a ground color of light brownish yellow, almost reddish yellow at times. Each of the wing covers is ornamented with five black lines running lengthwise. The thorax is marked with ten or more dark spots, while the head is small and bears one dark, three-cornered spot.

The mouth parts of the beetle consist of two pairs of jaws, the upper pair being dark-colored, hard, and horny. These enable the beetle to bite off bits of leaves and stems, which it chews and swallows.

Story of its life.— In the fall of the year the adult beetles burrow into the ground, where they pass the winter. In spring they work their way out of the ground early, and, after feeding on the potato plants for a few days, deposit their orange-colored eggs in clusters on the undersides of the leaves. The eggs hatch in a week or ten days, and the soft red grubs begin eating the leaves of the plant greedily. The grubs become full-grown in two or three weeks and go down into the ground, where each one changes to a pupa. The pupa, after resting for ten days or two weeks, transforms to a beetle, which comes forth ready to lay eggs for another generation.

Injury and control.— The beetles and grubs eat the plants and destroy whole fields of potatoes if not checked. Moreover, the tubers in the ground are of a poorer quality when the plants are injured by this insect.

Since the beetles and grubs have biting mouth parts, they may be controlled by spraying the plants with paris green, 1 pound to 100 gallons of water, to which 2 or 3 pounds of freshly slaked lime should be added in order to prevent burning of the plants. Arsenate of lead may be substituted for the paris green, and should be used at the rate of 4 pounds to 50 gallons of water. In many cases two or more applications of poison may be necessary.

Natural enemies.— Perhaps the most efficient enemies of the potato beetles are the ladybird beetles. At least eight different kinds of ladybirds attack and destroy the potato beetle in some of its stages. Both the adult ladybirds and their larvæ feed on the eggs and grubs of the potato beetle and destroy great numbers of them.

There are also several kinds of rather large, dark-colored beetles, known as ground beetles, which prey on the potato beetle and its grubs.

A certain fly, called a tachina fly, lays its eggs on the grubs. The eggs hatch and the maggots bore through the skin of the grub and live inside its body, finally killing it.

THE HOUSE FLY

Musca domestica

GLENN W. HERRICK

Appearance of the fly.— Several kinds of flies are often mistaken for house flies. House flies vary in size according to the quantity of food that the maggots obtain and to the temperature surrounding them while they are growing.

The house fly is grayish brown in color, with four dark lines on the thorax just behind the head; and the fifth vein in each wing turns abruptly upward at the end. The body and the legs are covered with rather long, stiff hairs.

Story of its life.—The small, white, slightly curved eggs are laid among decaying vegetable material, especially horse manure. They hatch in

Eggs of a house fly. Enlarged

twenty-four hours into maggots, which reach their full growth in five or six days and change to dark brown objects known as puparia. The pupæ, inside the puparia, rest quietly for about five days, and then transform to the adult flies. There may be eight or ten generations each season — each generation, of course, containing more flies than the preceding one.

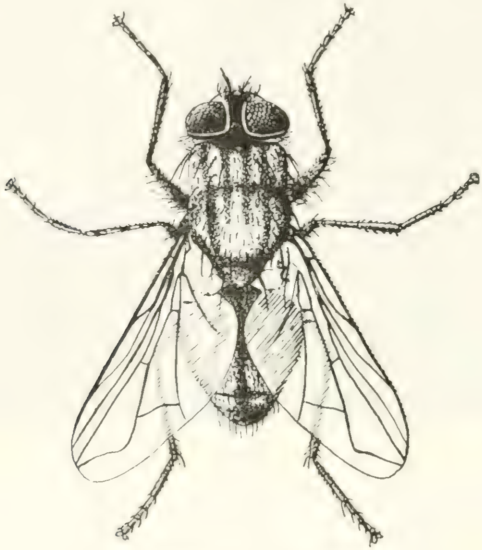
Injury and control.—House flies are known to be carriers of typhoid fever, cholera, dysentery, and other intestinal diseases, and are therefore very dangerous insects to allow in the house.

All stable manure should be drawn to the fields once a week, or put in a dark, tight room or pit. The closet or outhouse should be tight so

Larva, or maggot, and pupa of a house fly. Much enlarged

that no flies can enter it. The windows to kitchens and other rooms should be screened against flies. Flies should be caught in traps or on tanglefoot

paper, or killed with formalin baits. Two tablespoonfuls of formaldehyde (40 per cent) in a pint of equal parts of milk and water, set about the room in plates, will attract the flies and kill many of them, provided there is no other food or water for them to feed on. A piece of bread placed in the middle of each plate for the flies to alight on will make the bait more attractive. A constant warfare should be maintained against house flies.



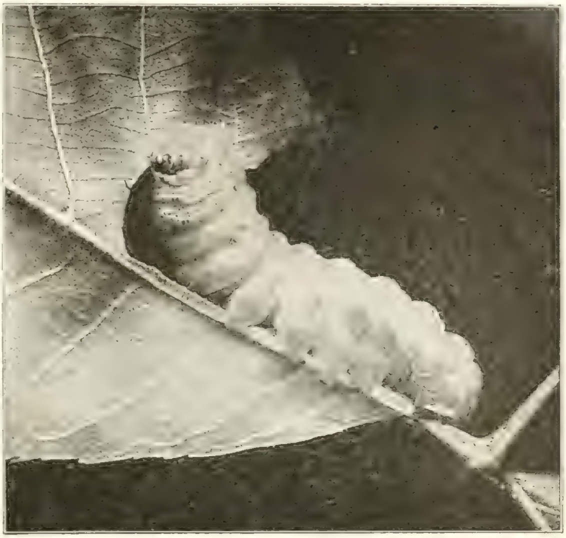
An adult house fly. Much enlarged

THE LUNA MOTH

ANNA BOTSFORD COMSTOCK

Every year the entomologists at Cornell receive several luna moths through the mails, and the senders always believe that this wonderful creature was never before discovered. When one looks at this exquisite moth he does not wonder that it is thus regarded. The first time the writer saw a luna was in her childhood, when she found one hanging, wings down, from a shrub in the forest mantle, and she cried "What a beautiful leaf!" But as she started to pluck it she discovered that it was a great green moth. The luna is the moth of one of the four native American silkworms; the three others are the cecropia, the promethea, and the polyphemus. Of them all the luna is the most beautiful. It may often be seen flying around electric lights during May and June, and has been likened to a great white ghost of a bird, appearing for a moment and then vanishing in the darkness.

The delicate green of the luna's wings is set off by the rose-purple velvet border of the front wings, and the white fur on the body and the inner edge of the hind wings. It has been called the Empress of the Night probably because of its ermine covering. The prolongations of the hind wings give the moth a most graceful shape, and at the same time probably protect it from observation, for during the daytime the moth usually hangs, wings down, beneath green leaves, and the long projection of the hind wings folded together resembles a petiole, making the insect look much like a large leaf.



Larva of the luna moth

The female luna is not merely graceful, she is also a knowing mother. She knows just what species of trees have leaves that will be acceptable food for her young. She always selects hickory, birch, oak, butternut, walnut, and some others, but could never be induced to lay her eggs on a hemlock or a cedar. The eggs are white and are laid a few in a row on a leaf. If the weather is warm, the eggs will hatch about a fortnight after they are laid.

Cocoon of the luna moth

The little caterpillars that hatch from these eggs are yellowish green. They eat the leaves with great avidity. The luna caterpillar, like other insects, grows by shedding its skeleton skin when this becomes too tight; after the fourth molt a yellow line appears along the side of its body. When

it is fully grown, it is a beautiful pea-green creature ornamented with tubercles that vary from red to rose color and yellow, those on the abdominal segments sometimes being blue. There is a strong likeness between the caterpillar of the luna and that of the polyphemus, and it takes an expert to tell them apart when they are fully grown.

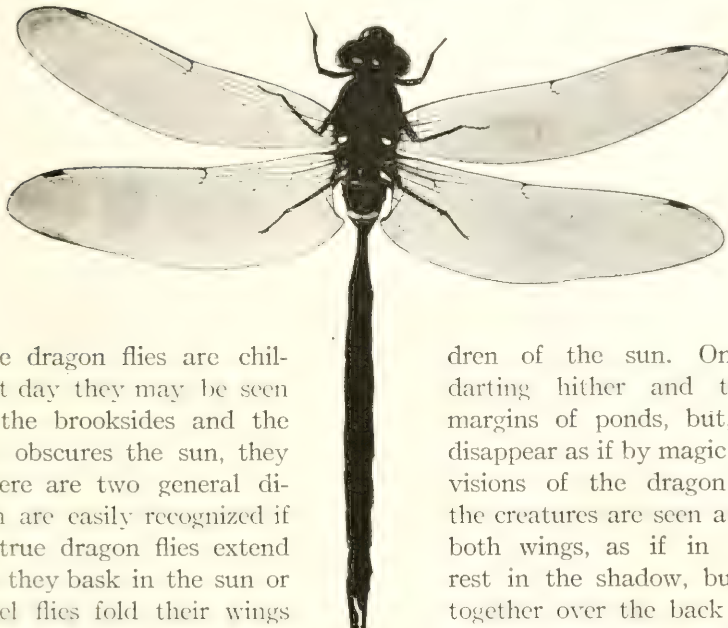
When the caterpillar gets ready to spin its cocoon, it draws two leaves closely around itself and weaves a cocoon within them. In the winter it usually falls with the leaves to the ground; there it remains safe and sound until the springtime comes, and the moth within it bursts the pupa skin and pushes its way out into the world.

Luna moth

Editors' note.— The editors are sometimes asked by teachers and children who have found what to them is a strange insect, whether it may be disposed of at a profit. The large biological supply houses have their own corps of collectors in the field, and there is little opportunity for an amateur collector to sell specimens. Moreover, it is only the more common forms that the inexperienced collector usually takes, and even then he is often likely to preserve them in such form that they are unacceptable to a supply company. It is a difficult field to enter successfully.

THE DRAGON FLIES

Anna Botsford Comstock



The dragon flies are children of the sun. On any bright day they may be seen darting hither and thither over the brooksides and the margins of ponds, but, if a cloud obscures the sun, they disappear as if by magic.

There are two general divisions of the dragon flies, which are easily recognized if the creatures are seen at rest. The true dragon flies extend both wings, as if in flight, while they bask in the sun or rest in the shadow, but the damsel flies fold their wings together over the back when resting. The damsel flies also have bodies more brilliantly colored than do the dragon flies, and they are more slender and delicate in form.

It is only during the winged stage that dragon flies and damsel flies are creatures of the sunshine and the air. They lay their eggs in the water, and from these eggs hatch creatures that are real ogres to other creatures that live on the bottom of the ponds. These young dragon flies are called nymphs; they are dingy in color, have six legs and no wings, although the wing pads on the back show where the wings are to be. Each one has a lower lip that covers the lower part of the face like a mask, but that can be thrust out far beyond the head to seize some insect not suspecting danger. The dragon fly and the damsel fly nymphs move so slowly and so harmonize with the color of their background that they are always in ambush awaiting their victims.

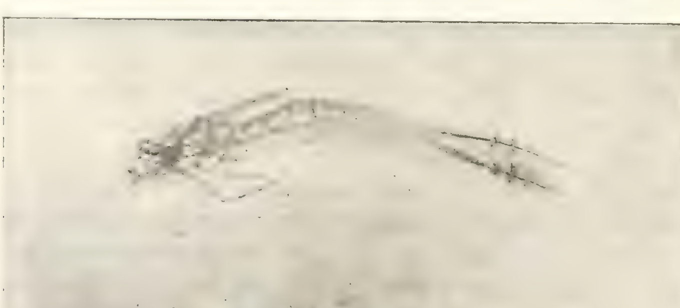
The true dragon fly nymph has a peculiar method of breathing. There is an enlargement in the rear end of the alimentary canal from which the breathing tubes lead in all directions. The nymph draws water into this cavity, thus bringing with the water air that is taken into the breathing tubes and purifies the blood. The nymph then expels the water with such force that its body is propelled forward, so that this act serves as a method of swimming as well as of breathing. The damsel fly nymph

has at the rear end of its body three long, platelike gills filled with breathing tubes, which extract air from the water.

Nymph of dragon fly

All the nymphs grow by shedding their skins as often as they become too small. When they finally have completed their growth, they crawl up and cling fast to some object above the surface of the water and shed their nymph skins. Henceforth they dart about on strong wings above the stream or the pond in the bottom of which was their early home. The dragon flies are very beneficial to mankind, for, as they fly swiftly, they capture and eat many mosquitoes.

The dragon fly and the damsel fly nymphs may be found on the bottom of any shallow pond or brook, and may be placed in an aquarium where their habits may be observed. However, only one should be put in a jar, since, if two are put in the same receptacle, the larger will eat the smaller. A jelly tumbler makes the best aquarium for one of these creatures. A little sand should be placed on the bottom and a small water weed should be planted in the sand. After the tumbler has been filled with water, it is ready to receive the captive nymph. Often the transformation from the nymph to the winged adult will take place in the schoolroom, and it is well worth while taking the time to have children watch this interesting process.



Nymph of damsel fly

PLANT STUDY

CORN

(For special study)

THE EDITORS

TEACHERS in rural schools will find that the corn plant has educational possibilities if one carries to its study the enthusiasm and interest that grow out of field experience. There are few teachers who will be indifferent to this subject if they will prepare themselves to teach it, for the development of the corn plant has had much to do with the history of this country, as well as with its agriculture. Teachers should read the following pages, and make a selection for lessons relating to corn. The material on corn has been prepared by specialists, and contains facts that will be of real interest to the children as they discover them first-hand under the teacher's direction.

In the autumn days from some rural schools in the State, classes will start out with the teachers to visit cornfields. Under the blue October sky, with dark clouds drifting here and there, the teacher will feel the spirit of the harvest time, and the children will be in sympathy with it. Between the harvested fields, the open road with its autumn roadside flora will be full of interest and of charm. During the trip the teacher may feel like calling the attention of the children to the autumn coloring of trees and plants. While all of the class may not respond to this, there are always some boys and girls who are impressed, and the experience will become a part of their joy in life in all the years to come. The ripened grain, the golden pumpkins, the blues, the greens, the yellows, the reds, the purples of fruit and foliage, and the hazy hillsides in the distance, will be suggestive for new and interesting studies.

In some fields there will, doubtless, be enough corn in condition for study so that many of the points for observation given on pages 1291 and 1292 can be considered. The opportunity to make observations on the plants where they have grown, will greatly increase the value of the information that the children gain. There is, perhaps, no other one plant that is more interesting in its full development than is corn. Boys in the country, many of whom will some day have fields of corn on their own farms, should learn the life history of this plant and the important place it holds in the agriculture of the United States.

In connection with the study of corn during the early fall, plans should be made for the celebration of Corn Day on Friday, December 3. (See page 1378.)

THE CORN PLANT

ANNA BOTSFORD COMSTOCK

EVERY student of plant life is interested in corn, one of the most beautiful plants in the world. It is a native of America, and the first white men who came to these shores found it extensively cultivated by the Indians. In studying corn it is well to keep before the pupils' minds that its worst enemy is the wind, which lays it low; it has therefore been obliged to develop certain forms of stalk, leaf, and root that enable it to withstand wind.

The cornstalk is a strong cylinder with a pithy center strengthened at short intervals by hard nodes, or joints. If all the stalk were as compact and rigid as the nodes, it would be inelastic and would break instead of bend; as it is, the stalk is elastic and will bend far over without breaking. The nodes are near together at the bottom, thus giving strength to the base; they are farther apart at the top where the wind strikes the stalk and forces it to either bow or break.

The corn leaf is attached to the stalk at a node, and its base clasps the stalk completely for some distance, thus rendering the latter stronger. Just where the leaf bends away from the stem is a little growth, which fits tightly around the stalk and is called the rain guard, since it prevents rain from seeping down between the stalk and the clasping leaf, where dampness would harbor destructive fungi.

The structure of the corn leaf is especially adapted to escape injury from the wind; the strong veins are parallel, and there is a flexible but strong midrib at the center. Severe windstorms injure only the tips of the leaves. The edges of the leaf are ruffled; this allows for a sidewise movement without breaking the margins.

The true roots of the corn plant penetrate the soil rather deeply, but they are hardly able to hold firm a stalk so slender and tall as that of the corn when the wind blows fiercely against it. Hence all about the base of the stalk are certain roots called brace roots, the office of which is to hold the stalk erect.

Each fertile cornstalk has two kinds of blossoms, staminate and pistillate. The staminate flowers, those that bear the pollen, appear at the tip of the stalk. They are called corn tassels and consist merely of anthers filled with pollen. The pistillate flowers are those that develop the seed and are called the ears of corn. They consist of many little white ovules set on a central stalk, or cob, and each ovule has a long style, called the corn silk. These pistillate flowers are very delicately wrapped about with leaves, which are changed to the soft protective clothing called the husks.

Each white ovule thrusts its thread of silk upward until its tip pushes out beyond the top of the husk; each silk is tipped with a stigma, which is ready to receive the pollen that falls upon it from the tassels of its own stalk or that is blown upon it from the tassels of other corn plants. If one of these ovules fails to receive pollen at the stigmatic tip of its long silken style, it does not develop into a kernel of corn, and the ear will then be imperfect. Such undeveloped kernels are said to be blasted. The ovules are set on the stem, or cob, in twin rows; thus each row is double, being made up of pairs of ovules. If different varieties of corn are planted near together, the pollen from one kind may be carried by the wind over to the ears of the other kinds, and the result will be a mixture of two varieties on the same cob.

The ears are borne at the joints, or nodes; and where the ear presses against it, the stalk is grooved to hold it more snugly. The husks show plainly that they are modified leaves, in the following ways: The husk has the same structure as the leaf; the outside husks are green and therefore do the work of leaves. The husk often changes to leaf shape at the tip of the ear, thus showing that the husk itself is that part of the leaf that normally clasps the stalk. As a matter of fact, the ear of corn is on a branch stalk, which has been much shortened so that the nodes are very close together, and the leaves therefore are arranged close together. By stripping the husks back, one by one, from the outside stiff green leaf to the inner stalk, the papery wrapping for the seed may be seen in all its stages.

Formerly seed corn was selected according to the following rule: "The ear should be of good length, cylindrical rather than pointed, the cob firm and well filled from butt to tip with kernels uniformly large, of good color, and in regular rows that show no space between." The modern method requires that seed corn be selected in the field from thrifty, high-yielding plants. After the ears have been selected, typical kernels should be germinated in a seed tester to prove the vigor of the seed before it is planted.

OBSERVATIONS FOR PUPILS

1. Describe the central stem of a stalk of ripe corn. How many joints, or nodes, are there in it? Of what use to the plant are these nodes? Are they near together at the top or at the bottom of the stalk?

2. Cut a cornstalk across and describe its structure. Which is the stronger, the outer or the inner portion?

3. Where are the leaves attached to the stem? Take off a leaf and note how much of it clasps the stem. Of what use to the plant is the extra strength given by the clasping leaf?

4. Note the little growth on the leaf where it comes off at an angle from the stalk. Do you think this prevents the rain from flowing down between the stalk and the clasping leaf?

5. Describe the veins in the corn leaf. How do the veins running in a lengthwise direction help to strengthen the leaf? Are the edges of the leaf straight or ruffled? Why has the leaf such an edge?

6. Describe the roots of the corn plant. Do they go deep into the ground? Describe the brace roots. How do they help the plant to stand firm against the force of the wind? From how far up the stem do the brace roots spring?

7. Where on the cornstalk are the ears borne? How many ears are there on a stalk? Remove an ear and describe how the stalk is shaped to fit the ear.

8. Examine the outside husks and compare them with the corn leaves. What facts indicate that the corn husk is an adapted leaf?

9. Describe how the inner husks differ from those outside in color and in texture.

10. After removing all the husks, carefully examine the ear and note whether there is a thread of corn silk for every kernel. Is there an equal amount of the silk lying between every two rows of kernels? Does the tip of each thread of silk reach up to the tip of the ear?

11. How many rows of kernels are there on the ear of corn? How many kernels in a row?

12. How many kernels are there on the whole ear?

13. Do any of the rows of kernels disappear toward the tip of the ear? If so, do they disappear in pairs?

14. Study a corn cob with no corn on it and note whether the rows of sockets in which the kernels grew are in distinct pairs.

15. Break an ear of corn in two and sketch the broken end, showing the relation of the cob to the kernels.

16. How many kinds of flowers are there on the cornstalk? Describe the flowers in which the pollen is borne. How does the pollen reach the pistillate flower, which is to grow into an ear of corn?

17. If you find that on an ear of corn a kernel is blasted, what happened to it?

18. If you plant sweet corn and field corn or black and white varieties of sweet corn near each other, what is the result? Why does this happen?

19. How does the corn look during a drought?

20. What are the points to consider in selecting corn for seed?

21. How many varieties of corn do you know? What is the difference between the dent and the flint varieties? Which ripens earlier? Which is more used for silage? Why?

SOME FACTS ABOUT CORN

J. L. STONE

The corn grown in New York State is chiefly put into silos for feeding dairy cows. To a less extent it is grown to maturity, husked, and cribbed for feeding pigs, horses, poultry, and other farm animals. To some extent, also, it is used as human food.

The climatic and soil conditions of New York State are not ideal for corn growing. Usually the summers are too cool and too short, and the soil lacks the abundant fertility that enables corn to reach its highest development. In many seasons the yield is not what might be desired. It is important that varieties or strains should be developed which have the best possible adaptation to conditions in New York State.

Flint corn plant

There are several types of corn of varying importance grown in the State. The children are chiefly familiar with and interested in pop corn and sweet corn; but these are of lesser economic importance than the kinds of corn used for feeding stock. Of these latter there are two well-recognized types, the flint corn, or so-called state corn, and the dent corn, or western corn. The flint varieties have smooth glossy kernels that suggest the name because of their hardness. As a rule they require a shorter period of development and consequently are better adapted to localities where the seasons are considered rather short for corn. The dent varieties also get the type name from the character of the kernel, which is usually somewhat shrunken or indented and gives the ear a rough appearance. Dent corn is about the only kind grown in the West and the South, the great corn-growing sections. In localities where the dents will properly mature, they often outyield the flint varieties by a considerable percentage, and there is much effort being put forth at the present time to develop early maturing dent varieties. Whether these early maturing sorts, when obtained, will outyield the flint varieties is an open question.

Among the mistakes made by farmers regarding seed corn one of the most common is that of depending on selecting the best ears from the crib at planting time rather than selecting the ears from the best stalks at harvesting time. The seed ears must be thoroughly dried before

being exposed to winter's cold; in fact, it is better if they can be stored in such a way that they are never exposed to very low temperature, although thoroughly dried corn is probably not much injured by low temperature.

Many ears of corn handled in the way the average farmer handles them will not furnish seeds that germinate at all. Even among those ears that have been most carefully dried and cared for, ears are often found having no seeds that germinate. It therefore becomes important that the farmer should ascertain the germinating quality of his seed even though it has been carefully selected and stored.


Dent corn plant

Experience teaches that the best results are secured by the use of seed that has been carefully selected for a series of years with reference to the locality in which it is to be grown. If, therefore, the farmer is to have the very best seed, he will probably have to grow and care for it himself. Although there are seedsmen who are now making a specialty of corn, who can furnish seed of most excellent quality for certain localities, the difficulty is that these seedsmen in their eagerness to sell will recommend the seed that is known to be excellent for Illinois for planting in New York or Maine. The chances are that seed grown in New York or Maine would be better for these sections.

Although corn is not so much at home in New York as in some other States, yet the fact remains that often on many New York soils the corn plant will produce a larger amount of good palatable animal food per acre or per a given amount of labor expense than almost any other crop.

Because of its large succulent stalks it is not so easy to cure and save corn by drying as some of the finer grasses. Owing to this fact the making of silage has come to be recognized as one of the best ways of utilizing the corn crop. It is found to be more economical both as to labor and as to waste to put the crop into the silo at harvest time rather than to handle it in other ways. Most animals require more or less succulent food during the winter, and silage meets this requirement. Properly made silage when judiciously fed is one of the most palatable, healthful, and profitable cattle feeds.

Every normal person should feel an earnest desire to leave the world morally, intellectually, and physically better than it was when he came into it. To give to the world or to a community a variety of farm crop

that is better than anything of its kind that preceded it, is certainly an ambition worthy of any one. Each individual farmer can contribute something toward the attainment of such an end. A few persons have been able to contribute to the public good such acquisitions as the Concord grape, the Burbank potato, and the Baldwin apple. But usually such new varieties are the result of the labors of a large number of persons who cooperate toward a common end. It is the effort that counts. Character is not so much dependent on the things accomplished as on the things attempted. Endeavor earnestly put forth to contribute a share toward the improvement of agricultural interest will be a marked factor in the development of a character whether distinction is achieved in that line or not.

Most farmers do not have any adequate conception of the importance of improving plants and animals, if they think of the matter at all; and the individual who persistently awakens their thoughts in this direction by his own work, or by his interest in social gatherings where such questions are discussed, will soon take high place among his fellows. When the children of the public schools come to an understanding of the importance and the possibility of improving the things they work with, they will be much more interested in home affairs and less inclined to seek the city a little later.

It is a fact now well recognized that there is educational value in work done in discovering the secrets and the moods of nature as well as in the modes and tenses of languages that have long ceased to be spoken.

HOW TO GROW CORN

E. R. MINNS[4]

Preparation.— In the fall before the corn is cut, select from a field of of ripe corn some good ears from good stalks. Before planting time a few kernels from each ear of seed corn should be tested to make sure that they will sprout vigorously.

The soil on which to grow a successful crop of corn should be chosen if possible from the most fertile part of the farm. Sod land that grew a crop of clover last year, and that has had a coat of barnyard manure scattered on it during the winter or the early spring, is an ideal place to plant corn. It should be carefully plowed early in the spring and harrowed several times before the date for planting arrives, so that the top three inches of soil will be fine and level.

Planting.— It will not be best to plant corn before the weather is warm, and all danger of frost is past, for corn needs warmth in the soil and air. Such weather as corn needs may be expected some time during May or early June

[4] Revised by the editors.

Make furrows three and a half feet apart the long way of the cornfield if possible, for that will facilitate the work of cultivation. The furrow marker drawn by one or two horses will be found the best means of furrowing the rows. It can also be used for check marking the field.

Plant the corn in hills, five kernels in each hill. Make the hills three and a half feet apart in the row for large-growing varieties, a less distance apart for small varieties, especially sweet corn and pop corn. Cover each hill with fine mellow soil so that the kernels lie buried about one and a half inches below the surface. In stiff, clayey soils a planting depth of one inch is better. If the soil is rather dry, pat the surface lightly with the back of the hoe blade to bring the soil moisture up around the buried kernels and make them sprout faster.

Hand planters are made that will drop from two to five kernels in each hill, and it will save time to use them; but one should be careful to see that enough loose soil falls in upon the corn to cover it well after the open blades of the planter are withdrawn from the soil.

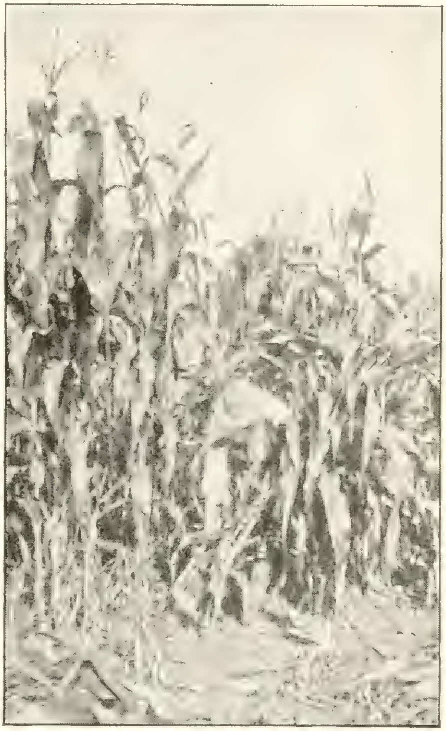
Typical corncrib

If a horse-drawn corn planter can be secured in the neighborhood, it will save making furrows before planting, and, if the field is level, will leave the rows in better condition for cultivation.

Cultivation.— In order to kill the sprouting weeds that lie near the surface of the soil, the field should be harrowed lightly or stirred with a weeder. About a week after the corn shoots can be plainly seen in the rows, it is time to begin using the cultivator. A quiet, steady horse hitched to a single cultivator, or a team and a wheel cultivator with small blades, should be used to stir the soil between the rows of corn. Cultivation kills the weeds, airs the soil, and prevents the evaporation of moisture from the deeper soil. Corn is benefited by frequent cultivation, at first moderately deep, then more shallow as the roots spread out through the soil. When the hot dry days of summer come, and the corn is tasseling, a small-toothed cultivator, which leaves the surface soil fine and nearly level, will be most useful. Unless weather conditions interfere, the cornfield should be cultivated four times or more. The soil between the hills in the row needs to be hoed as often as weeds appear. Never hoe or cultivate the cornfield when the soil is so moist that it feels sticky if squeezed in the hands.

Enemies.— The young corn plant has many enemies, among the most serious being crows, blackbirds, and cutworms. Various measures are used to frighten away the birds, among them the erection of a scarecrow or keeping a live crow captive in the field. The seed corn is sometimes coated lightly with coal tar, by dipping a wooden paddle into hot tar and stirring it rapidly among the kernels of corn. The coat of tar repels some of the enemies. Cutworms can often be caught in the neighborhood of individual hills, but for large areas they are controlled by fall plowing, and by the use of poisoned bait. The bait is made by moistening wheat bran with water that has been sweetened with molasses and treated with a poison, such as paris green or arsenate of lead. The mixture when spread along the rows, attracts the cutworms and kills them.

Thinning.— When the corn plants are about six inches high and danger from birds and insects seems to be past, every hill that has more than three stalks should have the extra ones removed by pulling them out. The three most vigorous ones should be left.



Cutting corn by hand

Harvesting.— In September when the lower leaves on the cornstalks begin to wither and many of the husks are becoming dry, it is time to cut and shock the corn crop if the stalks are to be used for fodder. About sixty hills of corn may be gathered into a shock and the tops bound together to make the shock stand up. Too large a shock will not cure properly, and some of the ears may thus be spoiled. Six weeks of good autumn weather will cure the corn shocks sufficiently for husking. After husking the ears the fodder should be tied in bundles to make handling easier, and stored under cover for winter feeding. If the corn is not to be for fodder, the ears will be better if left on the standing stalks until the latter are dead and dry and the ears are thoroughly ripened. After husking, the ears should be stored where air can circulate between them, and where rats and mice cannot destroy them.

SILOS AND SILAGE

E. R. MINNS

More than a hundred years ago some farmers in Europe learned how to preserve green forage plants, principally grasses, in pits so that they could be used as winter feed for domestic animals. The farmers excluded the air from the green grasses by covering them with earth; the grasses fermented somewhat, but when fed to the animals were highly relished. Forty-five years ago this system of preserving green fodders was introduced into France, and there the names *silo* and *ensilage* originated. These terms are still used.

A *silo* is a structure, which may be built of wood, stone, brick, concrete, or building blocks, in which green fodders are preserved for future feeding. The process of packing the fodder into the silo is known as *ensiling* it. *Ensilage* is the name given to the preserved fodder. This word has been shortened to *silage*, a term which is now used oftener than ensilage.

Why silage keeps.— Green fodder piled in the open air soon decays and becomes worthless for feed. If it is confined in an air-tight vessel and the air it contains driven out of it, the fermentation soon stops. In a silo the weight of the fodder and the tightness of the walls exclude enough of the air to preserve the silage for a year or even longer. It keeps because air does not get in, except at the top where the silage is removed for feeding.

Silos.— The first silos were built entirely underground, and the silage was weighted down with earth or other heavy material in order to drive out the air and better preserve the fodder. Now silos are built mainly above ground, though sometimes partly in the ground and partly above ground. The first silos were square or rectangular in shape. A few square silos are still in use, but by far the larger number are now built circular. It has been found that a silo that is round inside and fairly deep, has the best shape for preserving silage. The deeper the silo the tighter the silage is packed, and the better it keeps. Many silos have been built in this country of wooden frames lined with thin lumber and building paper, fastened tightly together so that air cannot enter through the walls. Many are built of upright staves, like those in a water tank, and held together with metal hoops. Some have been built of stone or brick laid in mortar, and in recent years silos have been built of reinforced concrete — a mixture of sand, gravel, and cement, with steel rods bedded in the concrete to give it more strength. Every year brings out some new method of building silos to meet the conditions in different parts of the United States. All silos need to have a good foundation, preferably of stone or concrete. A good many silos have a floor of concrete. In order to be convenient in use, a silo must have openings, one above another, on the side so that the silage can be taken out as it is wanted

for feed. The size of a silo should be in proportion to the number of animals to be fed from it.

Silage crops.— Although there are several farm crops that can be preserved in the silo, Indian corn is the most widely used for this purpose. The first man to make silage from Indian corn was a German sugar manufacturer, who was trying to grow varieties of corn imported from the United States. Because he could not ripen these varieties in his country and because he had been successful in making silage from sugar beet pulp and leaves, he thought of preserving the Indian corn, stalks, ears, and all, in his silos. In doing this he was very successful. The first silos built in the United States for preserving green fodder were erected in Michigan in 1875. Other crops that have been preserved successfully in this way are sorghum, wheat, oats, rye, alfalfa, clovers, and grasses. Some crops can be mixed with corn fodder for silage more successfully than they can be preserved alone. Sunflowers, soy beans, and alfalfa have been used in this way. It is easier to make good silage from Indian corn than from any of the other crops named, but sometimes the other crops can be preserved in the silo more economically than they can be dried and preserved as hay.

The silo furnishes the most economical means of preserving these farm crops, especially where the weather is likely to interfere with their being cured and stored in other ways. Besides this, the quality of succulence, or juiciness, found in the fodder is mostly preserved in the silage. Some chemical changes take place as the silage ferments, which, if properly controlled, make the silage easily digested and very palatable for domestic animals.

In order to pack the corn fodder into the silo and drive out the air so that the fodder will keep, it has been found best to use a machine called a silage cutter to cut up the stems and leaves into pieces about two inches or less in length. The freshly cut fodder is elevated to the top of the silo and distributed inside from a spout. There are two types of elevators, one an endless conveyor running in a wooden trough, the other a long pipe up which the cut fodder is blown by a strong current of air from a fan. Men are placed in the silo to tramp down this fodder and see that it is properly distributed, especially near the walls of the silo where the greatest danger from spoiling is found. If a silo is deep the weight of the fodder put into it forces the air out of the fodder gradually, and it settles down into a compact mass of silage, except at the top, where a little spoils. It is cheaper to throw away some of the spoiled silage on top than to hoist heavy weights up into the silo to press down the top of the silage. Some farmers after tramping down the silage at the top, pour on water, and sow oats thickly on the surface. Growing oats lessen

the danger of spoiling before the silo is opened. It requires from two weeks to a month for freshly cut fodder to change into good silage. Feeding may be begun from the top of the silo as soon as it is filled, thus avoiding any waste. If the silage is not fed fast enough from the top of the mass in a silo, the exposure to the air allows it to spoil on top. In order to keep the top in good condition it has been found best to feed the silage at the rate of two inches a day.

The uses of silage.— Silage can be fed to cattle, horses, and sheep, but is of doubtful value for feeding swine. It is best adapted to feeding dairy cattle, in order to maintain the flow of milk through the winter months and during summer droughts when pastures are bare. It has been found that cattle being fattened for beef thrive and make good gains when corn silage is a considerable part of their food. A large cow or steer can eat forty pounds of silage a day. Silage should not be fed so freely to horses and sheep as to cattle; but if fed in limited quantities, it helps to keep them in good condition during the winter months. Some kinds of silage, especially those made from alfalfa, clover, and other leguminous plants, are likely to have a strong odor and a blackened appearance, but this does not hinder the animals from liking them. Alfalfa and clover silage may to some extent be fed to poultry.

WHEN TO CUT CORN FOR THE SILO AND THE VARIETY TO GROW

G. F. WARREN

Many farmers are deceived as to the best variety of corn to grow for the silo because of the large yield of material that they get if the corn is cut green. Some persons cut corn in the milk stage. As will be seen by the table on the next page, this was the stage when corn gave the greatest yield of material, 16.3 tons per acre; but this large yield was all water except the 2.3 tons of dry matter. When ripe the corn yielded only 14.2 tons of silage; yet there was almost twice as much dry matter as in that cut at the earlier stage. Persons are often deceived by the large weight that they handle and forget that it is largely water. It is cheaper to get water out of a well. Corn should be thoroughly glazed before it is cut for the silo; that is, the kernels should begin to be hard, and no milk should come out of them when they are mashed. It ought to be just as mature as possible and yet keep. In spite of its large size, the stalk contains only about the same amount of dry matter as the ear, and the ear is worth much more for feed.

A variety that matures to the glazed stage in ordinary seasons, should be grown for the silo. Nothing but water is gained by raising bigger corn that does not mature to this stage.

YIELD OF SILAGE FROM A FIELD OF CORN WHEN CUT AT DIFFERENT STAGES

Stage of growth	Yield of corn per acre (tons)	Water per acre (tons)	Dry matter per acre (tons)
Fully tasseled	9.0	8.2	0.8
Fully silked	12.9	11.3	1.5
Kernels in the milk stage	16.3	14.0	2.3
Kernels glazed	16.1	12.5	3.6
Ripe	14.2	10.2	4.0

CORN JUDGING

E. G. MONTGOMERY

Editors' note.— In connection with the article on corn judging it is desirable to emphasize again the fact that the original selection of ears of corn for seed purposes should be made in a cornfield before the corn is cut and husked in order that the corn plant, as well as the ear itself, may be considered in selecting the seed. The use of the score card, however, as outlined and explained in the following article, has educational value and is a basis for the formation of practical judgment in the selection of seed corn. Teachers will find it helpful to use in preparation for and on Corn Day. The score card, as outlined by Professor Montgomery, differs somewhat from those that have been published in other years, but it is identical in principle, and seems to be an improvement over the old score cards. It can be used to score single ears and exhibits of ten ears each.

Corn judging is largely based on certain artificial standards of perfection. Judging consists in determining how closely a certain ear, or set of ears, conforms to the ideal standard. The practice is useful in developing powers of observation and critical examination.

In order to insure that all characters of the corn are examined in a comparative way, each character is considered separately, and given a value in accordance with its importance. The characters may be classed into two groups, namely, practical points and fancy points.

Practical points include those characters that have to do with the seed value, such as germinating quality.

Fancy points include those characters that have to do with symmetry and trueness to type, such as shape of ear or shape of kernel.

The score card is used by beginners to insure systematic work, but after a while the score card may be discarded. Experienced judges seldom use a score card.

Many score cards have been devised, all of which are arbitrary. The

greatest problem has been to determine just what points to use and what value to give each. The general tendency, however, has been to shift the weight from fancy characters to practical characters. The following score card is patterned after several now in use.

SCORE CARD FOR CORN

	Perfect score
Practical points indicating adaptation and viability	
Maturity	10
Plumpness of kernel	10
Color of kernel	10
Quality of germ	10
Size of shank	5
Fancy points indicating trueness to type	
Shape and proportions of ear	10
Tips	5
Butts	5
Spacing of rows	5
Shape of kernels	10
Uniformity of ears	
Size	5
Shape	5
Indentation	5
Kernel	5
Total	100

EXPLANATION OF SCORE CARD

The points allowed under each division of the score card represent the ideal, or perfect, score. Each ear, or set of ears, scored will fall more or less short of the ideal, and it is only by practice and the development of judgment that one becomes able to decide quickly and accurately how much should be deducted from a perfect score for the ear, or set of ears, under consideration. The following explanation of the score card will serve as a guide, but practice and experience in scoring corn are the only ways to develop a safe judgment.

Practical points

Maturity.— A lack of maturity is indicated in several ways: (1) the ear is soft so it can be twisted with the hands; (2) the kernels are discolored at the tips, due to poor drying; (3) the kernels are blistered, the

hull being raised in places due to frost or freezing while green; (4) the kernels are badly pinched at top, indicating lack of full development.

Plumpness of kernel.—A kernel pointed at the tip is likely to indicate lack of maturity and poor germinating quality. A kernel pinched at the top may indicate (1) lack of adaptation; (2) corn too large for soil, thus not being able to fully mature; (3) lack of maturity due to frost.

Color or luster.— Discoloration usually indicates immaturity or injured germinating quality. Grain with a bright luster and no discolor always germinates well, and comes from sound, mature ears that have been well preserved. Discoloration on the tip or the back of kernel always means a wet cob or soggy ear and poor curing.

Off-colored grains, such as white grains in yellow corn, mean mixture. All ears showing signs of mixture should be disqualified.

Quality of germ.— The appearance of germs in ears that have been tested and are known to be of good germinating quality, should be studied. A good germ should have a cream-white color, should be waxlike in texture, and should have only a small air-space about the plumule. Poor germs are most commonly indicated by (1) dark color in some part; (2) dry or shrunken appearance.

Size of shank.— A large, heavy shank (1) makes corn difficult to husk; (2) is likely to go with a large, wet cob that cures slowly. A very small shank will break easily, allowing the ear to fall to the ground. The shank should be from one-half to three-quarters the diameter of the cob.

Fancy points

Shape and proportions.—An ideal ear of the variety to be judged, should be examined first. In general the shape should be cylindrical, except in certain varieties. The proportions of circumference to length for dent corn are about 7 or 8 to 10, for flint corn 6 to 10.

Tips of ears.— Three characters are considered in examining the tip: (1) straight, regular rows; (2) depth of kernel – the kernels should be approximately as deep near the tip as in the middle of the ear; (3) exposure of cob. A slight exposure is not objected to if the tip is good in other points. Much exposed cob, however, is taken to indicate lack of adaptation.

Butts of ears.—The butt should (1) have regular rows; (2) the kernels should be full depth and shapely; (3) the shank scar should be medium in size; (4) the grains should be well rounded about the shank; (5) the butt should be neither expanded, due to enlarged cob, nor contracted, due to short grains or irregular rows.

Spacing of rows.—The spacing of rows and the shape of kernels can be examined at one time. For this purpose several kernels should be removed

near the middle of the ear. The kernels should be plump and of such shape that the crowns fit close together making tight rows.

Shape of kernels.—A few ears having kernels of good shape should be examined. The kernels should not be too narrow nor thin. They should be of such shape as to fit neatly with no lost spaces, and the tip especially should be plump. A keystone suggests the ideal shape, although flint corn kernels may be rounded.

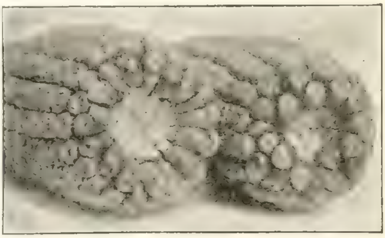
A well-filled tip

Uniformity.—In scoring a single ear the matter of uniformity cannot be considered to any great extent, and, so long as the ear is known to be true to type, is of average size and shape, and the variety is unmixed, it will usually be given nearly full credit for uniformity. In scoring a set of a number, for example ten ears, it is important to consider the uniformity of the ears in the whole set with regard to (1) size of ear; (2) shape of ear; (3) indentation, which will apply only to dent corn; (4) kernel. Uniformity is a strong indication of trueness to type. A good exhibit is assumed to be uniform. In judging uniformity the ears are best sorted according to type in each case. For example, ears having similar indentations are placed together. In a certain case there may be six ears with one kind of indentation, three with another, and one with another. The exhibit should be given credit for six, the largest number of a kind.

This same method should be followed with the other characters.

PRACTICE WORK IN SCORING CORN

In learning to judge corn it is best to confine attention at first to single characters, until the ideal for each character has been firmly fixed in mind. The following method has been found very practical:



Well-covered butts and medium shank scars

1. With a ten-ears exhibit for practice, select the ear that is most mature. Next select the least mature; then arrange the ten ears in order of merit when this point only is considered.

2. Take the next point on the score card, arrange the ears according to plumpness of kernel, and so on through all the points.

3. Select the best ear when practical points only are considered.

4. Select the best ear when fancy points only are considered.
5. Select the best ear all points considered.
6. Repeat this method with other ten-ears exhibits.

Teachers will find the boys and girls much interested in corn judging, and, if an occasional opportunity is made during the fall to practice the scoring of corn, the results will be found worth while from an educational point of view, and from the point of view of general interest. The practice exercises may well look forward to, and reach their culmination in, Corn Day (page 1378).

TESTING THE GERMINATION OF SEED CORN

MILTON PRATT JONES[5]

It is highly important every year that the ears of corn that are to be used for seed be tested as to their ability to germinate. The boys and girls can test the seed corn to be used on the whole farm and can feel that their work really amounts to something.

The first process in the preparation of the seed corn is the selection of the best ears. This should be done at harvest time by selecting good ears from good stalks. A considerable number more than will be necessary to plant a crop of the size desired should be selected; then the germination of each of the ears should be tested by the following method.

Method of testing germination

The simplest way to test seed corn is by means of the germinating box. Almost any sort of a box from four to eight inches deep and of a size depending on the number of ears to be tested can be used. The box, however, should not be too large for one person to carry easily. Soap boxes or tomato can boxes, which may be obtained at a grocery store, are perfectly satisfactory. The box should be half filled with sand or sawdust, preferably sawdust, thoroughly moistened but not saturated. The sawdust should be two or three inches deep, and should be packed down so that the surface is even and smooth.

A piece of white cloth slightly larger than the size of the box should be ruled off with a lead pencil, checkerboard fashion, into squares from one and one-half to two and one-half inches in size. Each square should be numbered. This cloth should be placed over and in close contact with the sawdust or the sand, and tacked to the corners and the sides of the box.

Then the seed ears that are to be tested for germination, should be arranged in a row on the floor, a table, or a shelf, in a place where they

[5] Revised by the editors.

will not be disturbed. In order to avoid mistakes it is well to number every ear. This can be done by writing the number on a little piece of thin cardboard and inserting it between the rows of kernels; or the number may be written on a piece of paper, and this paper fastened to the ear by pushing a pin through it into the butt of the cob, or it may be held by a rubber band put around the ear. If there is no possibility that the position of the ears will be disturbed, this precaution may not be necessary.

At the time of starting the germination test each ear should be carefully studied, and a few notes made covering the following points: (1) Is the appearance of the corn bright or dull? (2) Are there any discolored areas on the backs or the tips of the grain kernels? (3) Are the tips of the kernels pointed or plump? (4) Is the general texture of the grain hard or soft? (5) Is the covering of the germ smooth or blistered? (6) Is the texture of the germ soft, medium, or dry? (7) Is there an air space around the plumule? If present, is the air space large or small? (8) Is the color of the germ the normal cream-white, or is it yellowish or dark?

At the end of the germination test when the results are being determined these records of each ear should be considered in connection with the germinating power of the ear. It will soon be found that there is a distinct correlation between the general appearance of the ear of corn and its germinating power, and it is important that one should become skilled, as far as possible, in determining the germinating power from the appearance of the ears. This will naturally reduce the number of ears that it is necessary to test for germination because there will be fewer eliminated by the germination test.

Six kernels should be removed from each ear with a pocket knife. One kernel should be taken from near the tip, one from the middle, and one from the butt, on each side of the ear. These six kernels should be carefully laid in the square in the box corresponding to the number of the ear. Thus six kernels from ear no. 1 will go into square no. 1, and six kernels from ear no. 2 into square no. 2, and so on. It is best to place the kernels all pointing one way and with the germ side up.

After the squares in the box are filled with kernels from as many correspondingly numbered ears, a piece of thin cloth should be placed over them, care being taken not to disarrange or change the position of the kernels. This cloth should be gently sprinkled with water, and on top of it two thoroughly wet burlap bags should be laid and pressed down closely at the corners and along the sides of the box in order to keep all the kernels uniformly moist. The box should be placed near a stove, where it is warm and where the temperature never goes below freezing.

The kitchen is usually a good place. The bags on the top of the box should be sprinkled if there is any danger of their drying out.

Within from four to seven days, depending to a great extent on the temperature at which the germinating box is kept, the kernels will have germinated sufficiently to allow the selection of the ears to be made. The bags and the cloth should be taken off with great care so that the

Corn tested for germination

corn will not be disturbed. The kernels of each square should be examined in connection with the ear from which they were taken and compared with the germinating kernels of the other ears. Great differences will at once be apparent. Some ears will be represented by kernels part of which, as in ear no. 8 in the illustration, show no germination. All such ears should be discarded. Other ears will be represented by kernels

that, as in no. 7, germinate weakly. The roots will be thin, yellow, and sickly. Perhaps some kernels will be moldy, and by their appearance as a whole show clearly lack of vigor. Those ears, all or part of whose kernels germinate weakly, should be discarded. The kernels of still other ears will germinate vigorously with strong, healthy sprouts, as is the case in ears nos. 3 and 4. Ears represented by such kernels should be used for planting.

If it is found necessary to buy seed corn in bulk, a sample should be obtained from the seed merchant and several hundred kernels tested by the method described. A germination test of such bulk samples can also easily be made by putting a piece of blotting paper in the bottom of a pan, thoroughly moistening this, and putting the kernels on it. The corn should be covered with some more wet blotting paper or wet cloths and a pane of glass should be placed over the top of the pan to prevent drying out. The blotting paper and cloths must be kept damp. At the end of five or six days examine the corn; if less than eighty out of one hundred kernels germinate vigorously, it cannot be considered good seed corn.

Every farmer in the State should test the germination of his seed corn. It is important to begin this year and test the seed intended for next spring's planting. The work had best be done during some of the winter evenings before the spring work begins. The boys and girls should do the seed testing.

CORN FOODS

Flora Rose

CORN MEAL MUSH

1 cupful corn meal
$5\frac{1}{4}$ cupfuls water
$\frac{1}{2}$ teaspoonful salt

Mix the corn meal with 1 cupful cold water, and add $4\frac{1}{4}$ cupfuls of boiling water. Add the salt. Cook this mixture over direct heat for five minutes; then set it over hot water and cook for one hour or longer. Corn meal mush is better if cooked for several hours.

CORN MEAL GEMS

1 cupful thick sour milk
$\frac{1}{4}$ level teaspoonful soda
1 beaten egg
$\frac{3}{4}$ to 1 cupful corn meal
1 level teaspoonful butter, or lard, or drippings, melted
1 cupful white flour mixed with 1 level teaspoonful baking powder

Mix the soda and the sour milk. Add the egg, the melted butter, the flour, and the corn meal, and stir the batter thoroughly. Pour it into well-buttered gem pans, and bake the gems in a medium hot oven for about 25 minutes.

CORN PUDDING

1 can corn
  or
1 pint grated fresh corn
1 cupful milk
2 eggs
2 level teaspoonfuls butter, melted
Salt
Pepper

Mix all the ingredients together. Pour the mixture into a buttered baking-dish. Set the dish in a pan of water, and bake the pudding until the custard is firm. A knife blade run into the custard shows the firmness.

INDIAN PUDDING

1 quart milk
½ cupful yellow corn meal
3 eggs
¼ teaspoonful salt
1 teaspoonful cinnamon
1 teaspoonful allspice
2 teaspoonfuls ginger
1 cupful seeded raisins
½ cupful finely chopped suet or ¼ cupful butter
¼ cupful brown sugar
¼ cupful molasses
  or
½ cupful sugar or ½ cupful molasses

Scald 1 pint of the milk. Mix the corn meal with 1 cupful of the remaining milk. Add this mixture gradually to the scalded milk and cook it for 5 minutes or until it thickens, stirring it constantly to prevent lumping. Stir into this the remainder of the milk, the beaten eggs, the suet, the sugar, the molasses, the salt, and the spices. Pour the mixture into a buttered baking-dish and bake it slowly for 3 hours. If butter is used, baking may be completed in 2 or 2½ hours. An hour after the baking begins, a cupful of seeded raisins sprinkled with flour may be stirred in.

JOHNNY CAKE

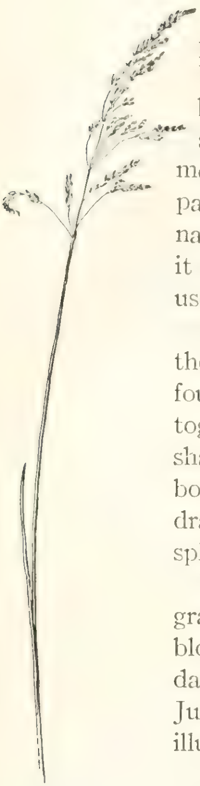
1 cupful sour milk
½ level teaspoonful soda
2 eggs
¼ cupful shortening, melted
½ cupful sugar
1½ cupfuls white flour
3 level teaspoonfuls baking powder
¼ cupful Indian meal
¼ teaspoonful salt

Mix the soda and the sour milk. Add the beaten eggs, the shortening, the sugar, the white flour, which has been mixed with the baking powder, the Indian meal, and the salt. Pour the batter into a shallow buttered pan, and bake it from 20 to 30 minutes.

ONE GRASS, ONE CLOVER, AND ONE GRAIN FOR IDENTIFICATION IN 1915–1916

PAUL J. WHITE

KENTUCKY BLUE GRASS



Kentucky blue grass

Although Kentucky blue grass is not the most important grass in this State, it is one of the most common. It grows wherever the soil is good and the land has not been plowed for a number of years. Farmers seldom sow this grass, yet it is nearly always present in old meadows and pastures. In fact, it is the most valuable pasture grass that there is in the State. It comes in naturally if a field is left to itself; of course, if it is sown it will appear much more quickly. It is the grass most used for lawns.

Blue grass may be distinguished from other grasses by the leaf. If the end of the leaf be examined, it will be found to be closed; that is, the edges of the leaf come together at the end, forming what is known as a keel-shaped leaf. The end of the leaf resembles the keel of a boat. If the end of the blue grass leaf is smoothed out by drawing the leaf between thumb and finger, the leaf will split, and a notch will be formed at the end.

When in blossom, blue grass is distinct from other grasses with the exception of redtop. But as blue grass blossoms three or four weeks before redtop, there is little danger of confusing the two. Blue grass blossoms in June, while redtop does not blossom until July. The illustration shows a good specimen of blue grass.

It would be a good plan to have the children bring into the schoolroom as many grasses as they can find, and see whether they can distinguish the blue grass by the description here given.

RED CLOVER

Red clover is one of the most valuable plants to the farmer in New York State. It is valuable because it is so useful for making hay and for pastures, and also because it greatly improves any soil in which it grows. It may be found in almost any part of the State, yet it must have fairly good soil in order to grow well.

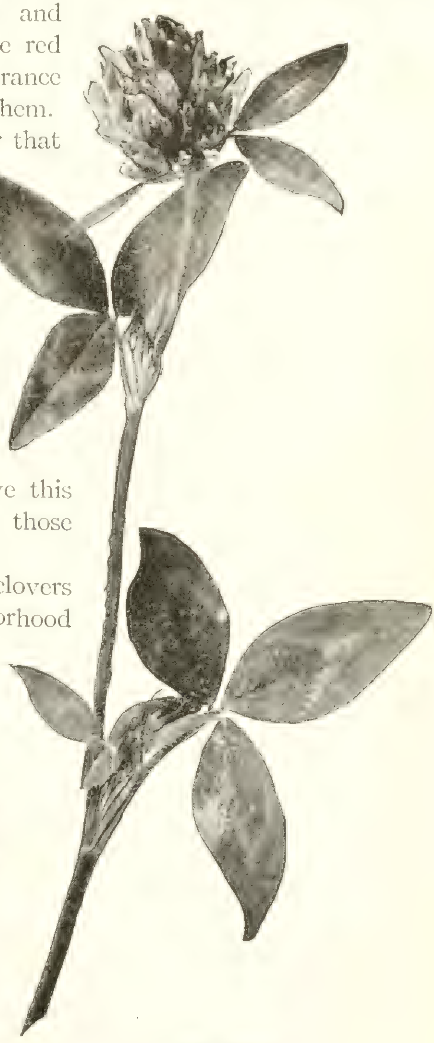
Red clover is so common that it scarcely seems necessary to describe the plant. There are two kinds grown in this State: one is known as *medium red*, which is the ordinary kind; the other is called *mammoth*,

or *pea-vine*. The only difference between the two is that mammoth clover is much larger than medium-red clover, and blossoms about three weeks later.

Red clover grows from one to two feet in height. It blossoms twice during the summer, first in June and again in August. The blossoms are red and present a very beautiful appearance when a whole field is covered with them.

There are several kinds of clover that grow in this State, all of which are easy to name when in flower. It is not easy, however, to tell them apart when only the stems and the leaves are to be seen. The leaves of red clover are hairy all over and are composed of three small leaflets. There is a whitish mark on the leaflet that looks somewhat like an arrowhead. Clover leaves that have this mark and are hairy, are sure to be those of red clover.

Teachers should have all the clovers that can be found in the neighborhood brought into the schoolroom so that the children can learn to distinguish the red clover.



Red clover

WHEAT

Without doubt, wheat is the most valuable grain plant in the world for several reasons. It will grow in nearly any part of the world in which man is able to live. It has been grown for thousands of years in the hot climate of Egypt, and it is one of the chief crops of northern Europe. Wheat is the chief article of diet of nearly all civilized nations. It can be used in a great variety of ways. In this country it is the cheapest food, with the possible exception of corn. With the exception of rye, wheat is the only grain that can be made into yeast bread. When yeast is added to dough made of rye or wheat flour, it rises by reason of the gluten that the flour contains

In this State, wheat is usually planted in the fall. In the Northwestern States, however, it may be sown in the spring. Not all the seeds that are planted mature grain, but those that do mature generally produce from one to six stalks, each of which bears a head of from fifteen to thirty kernels.

Wheat, barley, and rye look very much alike when matured. Barley grains do not shell out of the hull when threshed as do wheat and rye. Moreover, there are either one or three kernels of barley in each little group that forms a part of the head. The rye head is made up of groups of two kernels, while wheat may have from two to five kernels in a group.

GENERAL PLANT STUDY

THE EDITORS

IT IS important for the rural teacher to take every opportunity to give boys and girls an intelligent interest in plant life. This subject carries with it a means to mental development and opens the way to a permanent resource, which, through all time, plant lovers have enjoyed.

Intimacy with a single plant will make a good beginning in plant study. The plant may be growing out of doors, or it may be a house plant. The observations of the children should be so directed that they will become interested in the changes in the leaves, the blossom, and the seed, that take place from day to day.

The school time should never be so filled that there is no opportunity to discuss the coming of the spring flowers, or to talk over the seed time in autumn. Those who are acquainted with the late summer and autumn woods and waysides, where the fruits of jack-in-the-pulpit, Solomon's seal, and blue cohosh, red rose hips, and witch-hazel blossoms give rare and rich color, will find abundant material for encouraging out-of-door observation, and when springtime comes, each day bringing some new blossom on wood or roadside plant, the teacher can do no better work than to open the eyes of the boys and girls to the richness of interest in their out-of-door surroundings.

Each year in the New York State syllabus special plants are given for study. This does not mean that other plants may not be studied, but it gives a suggestive list, which teachers may find interesting for class lessons. This list should be placed on the blackboard or the bulletin board, so that the children may know what to look for during the year in order to complete the work before the last day of school. Some of these plants will furnish material for an interesting quest, which is always valuable in out-of-door study. Who will find the first claytonia, or

spring beauty? Where was it growing? What plant associates did it have?

It is not advisable to require young children to make a very detailed observation of plants. A broad, wholesome field knowledge will probably be most satisfactory for the elementary grades. The boys and girls should be able to make a mental picture, at any time, of a large number of the common plants in the country round. They should be able to give the approximate height, the habit of growth, the kind of leaf (whether simple or compound), perhaps the margin of the leaf, the color of the blossoms, the shape of the corolla (whether regular or irregular), and some of the larger likenesses of each plant to one or more plants of the same kin. If the teacher is a good botanist and is interested in the subject, she may encourage the children to more intensive work; but good general observation and happy, wholesome interest will probably make the best foundation for scientific study in the secondary schools and the universities.

Before beginning the work on the recognition of plants for 1915-1916, it would be well for the teachers to read the following article. In the autumn the children enjoy the study of leaves, and much can be learned as to shapes, margins, and the like.

HELPS IN THE STUDY OF PLANTS

E. L. Palmer

When one wishes to learn the name of any flower that he may happen to pick up, he usually does one of two things: either he asks some person to name it for him, or he attempts to look it up for himself in a book. There are two kinds of books on plants, the popular and the scientific. The former is usually the more convenient for general work, but as a rule the scientific book is the more accurate. The difficulty with scientific books is that to most persons they are unintelligible because of the terms used in describing the parts of the plant. It is hoped that this article will explain clearly the meaning of some of the more common terms used.

In the first place, the parts of a flower should be learned. The parts of flowers are arranged in groups, usually four. In the trillium, for example, there is on the outside a set of three green, leaflike structures. Each of these is known as a *sepal*, and the three together make up what is known as the *calyx*. In most flowers the calyx is green. Within the calyx there is a second set of structures, which are either white or conspicuously colored. This set of structures is known as the *corolla*, and the separate parts are the *petals*. The corolla and the calyx constitute what is known as the *floral envelope*, which is usually made up of structures that are more or less leaflike. The floral envelope is not really essential in the production of seeds.

The essential parts are the two inner series. The outer of these is usually made up of structures that look like stalks with a thickened part on the end. These structures are known as the *stamens*; the stalk is known as the *filament*, and the thickened part on the end as the *anther*. When the anther is ripe it breaks and gives off a powdery substance known as *pollen*.

The inner series of structures is made up of *carpels*, these being often united to form the *pistil*. The pistil bears the seeds. The pistil may be composed of either one or more carpels; in either case it is subdivided into three parts. The lowest part, which is usually the largest part, is called the *ovary*. This contains the seed or seeds. Above the ovary the pistil is elongated into a structure known as the *style*, at the top of which is the *stigma*. The number of branches, or lobes, in the stigma usually indicates the number of carpels in the pistil.

The stem that bears a flower is known as the *pedicel*; and the end of the pedicel, or the part that the parts of the flower actually touch, is called the *receptacle*, or *torus*.

Now that the parts have been named, some of the variations and the combinations that occur, should be considered. In the first place, not all the parts are always present. Often, as in the anemone, one of the sets of the floral envelope is absent, and in that case the remaining set is considered the calyx. In many flowers the stamens are absent; in that case there occur also on the same plant, or on another plant of the same species, flowers with the pistils absent. In such plants the flowers are said to be *unisexual*. When pistils and stamens occur in separate flowers on the same plant, the plant is said to be *monœcious*; and when pistillate flowers (those without stamens) occur on one plant and staminate flowers (those without pistils) on another, the plant is said to be *diœcious*. In a *perfect* flower, the pistils and the stamens are in the same flower.

Another variation that is commonly found has the parts of a series united. When the sepals are united, the term *gamosepalous* is used, and when the petals are united the term *gamopetalous*. A good example of a gamopetalous flower is the morning-glory. The terms used in case the petals are separate and the sepals are separate are *polypetalous* and *polysepalous*, respectively. Besides the parts of a series being united, the different series are sometimes united. Different terms are used in these cases, also. When all the series are separate, as in figure 1, the flower is said to be *hypogynous*. The flower of a buttercup is hypogynous. It is rather common to find the calyx, the corolla, and the stamens united, as in figure 2. In this case the term *perigynous* is used. When all the series are united, and the petals, the stamens, and the sepals seem to come from the top of the ovary, as in figure 3, the term *epigynous* is used. The com-

mon elderberry is epigynous. In the case of hypogynous flowers the ovary is said to be *superior*, since it is situated above the other parts. In the case of epigynous flowers the ovary is said to be *inferior*, because it is situated below the other parts. In case the anthers of the stamens are united, the term *syngenesious* is used.

In the foregoing have been given most of the terms used in describing the parts of a single flower. Groups of flowers will now be considered. A flower-bearing part of a plant, or the plan of flower arrangement, is called the *inflorescence*. The most simple type of inflorescence is the solitary arrangement (Fig. 4). Here one flower appears in the axil of the leaf and terminates growth in that direction.

If the flower is borne close to the main stem, and is without a stem, or pedicel, of its own, the flower is said to be *sessile*. This leads to the next form of inflorescence, the *spike*. In a spike there is a series of flowers that are sessile, or nearly so, arranged along a more or less elongated common axis (Fig. 5). The common blue vervain shows a good example of a spike. A form of spike that is fairly common is the *catkin*. A catkin is a flexuous, scaly spike, such as is found in poplars, birches, and the like. A catkin is illustrated in figure 6.

There is still another form of inflorescence in which the flowers are sessile. This is found in sunflowers and daisies and is called a *head*. The arrangement of clover flowers also is called a head. A sunflower head is called a composite head. In it, as is shown in figure 13, there are two kinds of flowers. The center flowers are short and densely massed together, and are called *disk flowers*. The outer flowers (a) are usually conspicuous and are called *ray flowers*. Outside of the ray flowers there is a series of green bracts, which apparently bind together the flowers of the head. This series of structures is called the *involucre*, and its parts are the *bracts of the involucre*. The broad structure on which the flowers are borne (d) is called the *receptacle*. A composite head may be composed entirely of ray flowers, or the ray flowers may be entirely absent.

The remaining forms of inflorescence have the flowers borne on pedicels instead of being sessile. One of the simplest forms is the *raceme* (Fig. 7). In this case the flowers are borne on pedicels arranged along a common axis, as in a spike, the difference being that here the flowers are not sessile. In a raceme the lower flowers are the older, and usually the larger. Growth continues for an indefinite time and is said to be *indeterminate*. A *cyme* differs from a raceme in that the terminal flowers are the older and larger. New flowers appear below the old ones, and growth in length ceases with the first flowers. A growth of this type is called a *determinate* growth. A cyme is shown diagrammatically in figure 8.

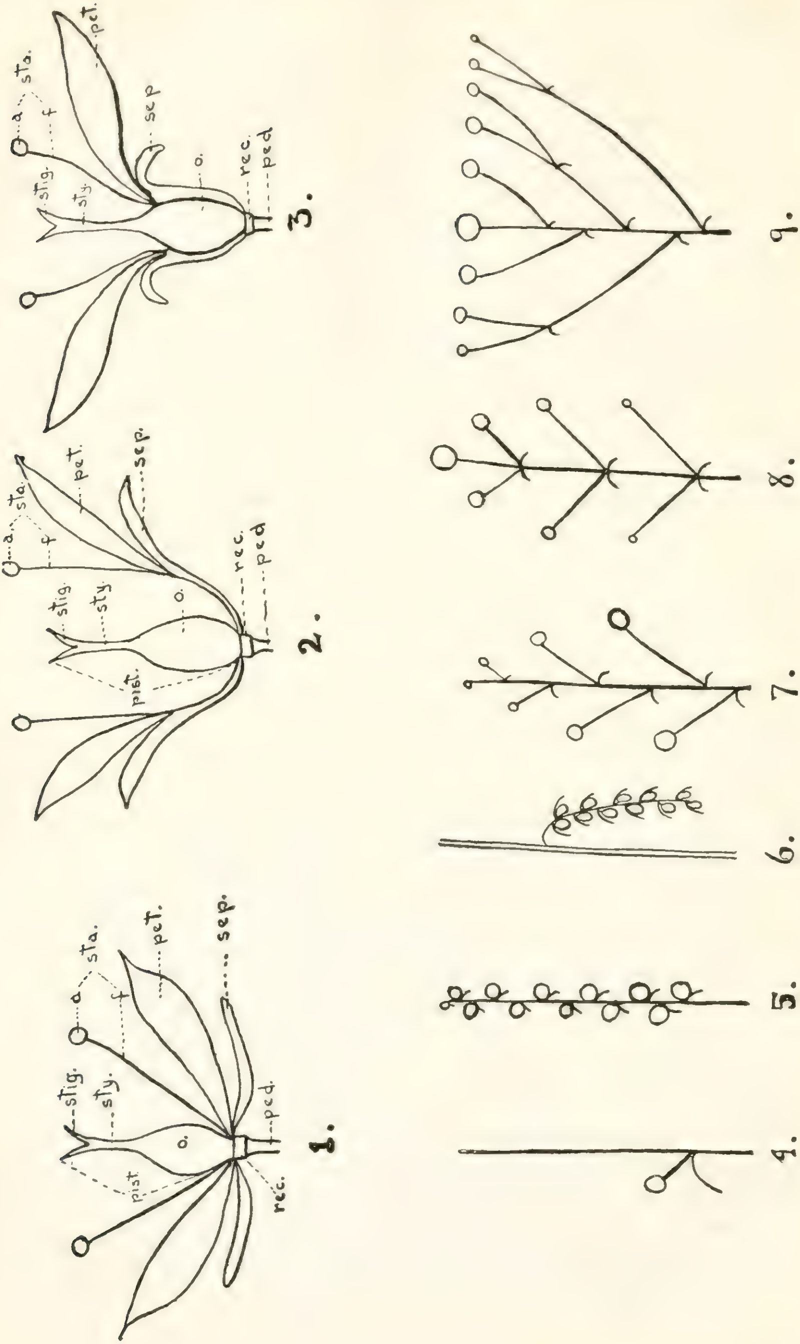

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FIG. 1.— *Diagram of an hypogynous flower, of which buttercup, trillium, and chickweed are examples*
FIG. 2.— *Diagram of perigynous flower, found in plum and apple*
FIG. 3.— *Diagram of an epigynous flower, examples of which are dogwood, elderberry, and sunflower*
FIGS. 1 – 3.— *Stig.– stigma; sty.– style; o.– ovary; pist.– pistil; a.– anther; f.– filament; sta.– stamen; pet.– petal; sep.– sepal; rec.– receptacle; ped.– pedicel*
FIG. 4.— *Solitary inflorescence, as in abutilon, moneywort, and whorled loosestrife*
FIG. 5.— *Spike form of inflorescence, as in blue vervain, heal-all, and plantain*
FIG. 6.— *Catkin form of inflorescence, as in willow, oak, poplar, birch, and butternut*
FIG. 7.— *Raceme, as in cork elm, barberry, and wistaria*
FIG. 8.— *Cyme, or indeterminate inflorescence, such as is found in apple or geranium*
FIG. 9.— *Corymb: the form of inflorescence commonly seen in elderberry*

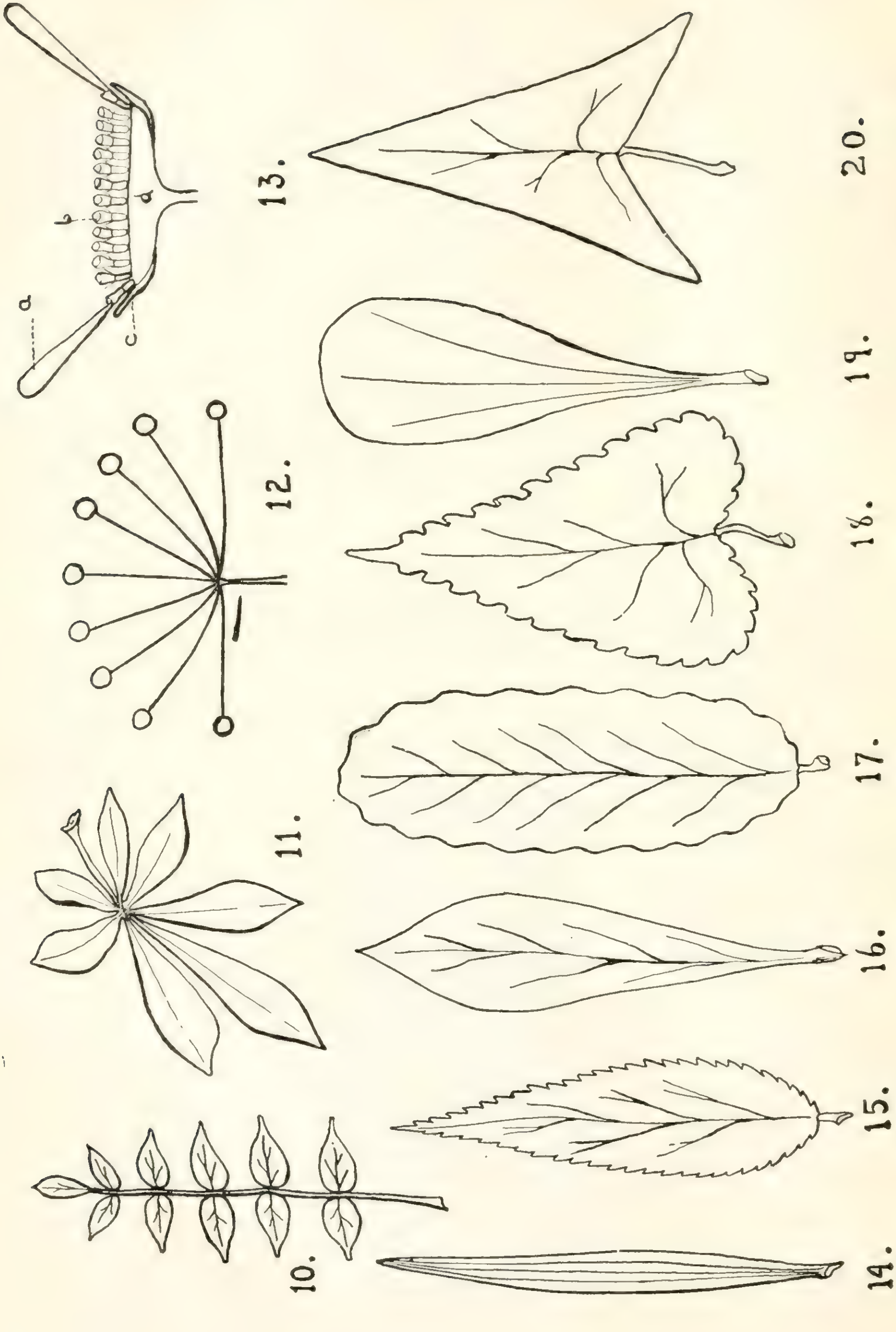
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Fig. 10.— *Pinnately compound leaf, as in locust, pea, hickory, and walnut*
Fig. 11.— *Palmately compound leaf, as in horse-chestnut, Virginia creeper, and poison ivy*
Fig. 12.— *Simple umbel, as in milkweed and cherry. The wild carrot has a compound umbel*
Fig. 13.— *Composite head: a — ray flower; b — disk flower; c — involucre; d — receptacle. The daisy has a composite head. The flowers may be all ray flowers, all disk flowers, or some ray and some disk*
Fig. 14.— *Linear leaf with parallel veins and entire margin, as in narrow-leaved spring beauty, blue-eyed grass, and cat-tail*
Fig. 15.— *Lanceolate leaf with netted veins and serrate margin, as in wild peppergrass*
Fig. 16.— *Oblanceolate leaf with entire margin*
Fig. 17.— *Oval leaf with undulate margin, as in witch-hazel*
Fig. 18.— *Cordate leaf with crenate margin, as in English violet*
Fig. 19.— *Spatulate leaf with palmate veins and entire margin*
Fig. 20.— *Hastate leaf, as some leaves of buckwheat and field bindweed*

In a cyme and a raceme the pedicels on which the flowers are borne are shorter than the main axis, and the flowers are arranged in a sort of pyramid. A form of inflorescence exists, however, in which the flower cluster is flat-topped, as in the common yarrow. This form of inflorescence is called a *corymb*. A corymb may be a determinate or an indeterminate form of inflorescence, in the general use of the term. Figure 9 shows a determinate corymb.

In the forms previously described, the flowers have arisen from different points on the same or different axes. A form is found rather commonly, however, in which all the flower axes arise from the same point. Such an inflorescence is called an *umbel* (Fig. 12).

Various modifications of the forms given exist. A raceme, a cyme, a corymb, or an umbel may be compound; that is, the axillary branches of an inflorescence may in turn be divided into the given type. A compound raceme of a loose, irregular nature is called a *panicle*.

Leaves are simple or compound. A simple leaf has but one blade. A compound leaf has more than one blade. The various types of leaves are illustrated on page 1318. There are other types, but most of the common forms are shown. Compound leaves are of two types, *pinnately compound* and *palmately compound* (Figs. 10 and 11). A pinnately compound leaf has the leaflets arranged along the main axis, arising from different points. A palmately compound leaf has the leaflets arising from the same point. If this is learned well, it will be easy to remember the different types of leaf venation. These are discussed later in the next paragraph. Leaves are considered as compound if the leaflets are distinct. If there seems to be a tendency toward division into leaflets, the leaves are said to be lobed. Here, again, there are two types, *pinnately lobed* and *palmately lobed*. A good example of a pinnately lobed leaf is the dandelion; of a palmately lobed leaf, the common sugar maple. The shapes of different leaves can best be shown by the diagrams. The commoner types of margins also are shown.

Leaf venation is interesting and important. The simplest type is the *parallel-veined* type (Fig. 14). Here the veins start at one end and extend along beside one another to the opposite end of the leaf. In case the veins start together and extend in the same direction but do not come together again, as in figure 19, the term *palmately veined* is used. In a large number of leaves, however, there is one main vein called the *midrib* from which smaller veins branch (Fig. 17) in which case the term *pinnately veined* is used. Pinnately veined leaves and palmately veined leaves usually have many smaller veins branching in all directions from the larger veins and giving rise to the term *netted-veined*.

PLANTS TO BE RECOGNIZED IN 1915–1916

THE EDITORS

From a study of the syllabus topic "Plants to be recognized," the pupils should become familiar with some of the important characteristics of each plant that can be learned in the field. A few suggestions as to such characteristics, are made here, and, if the teacher wishes to give further work, additional material can be found in any good botany.

Violet.—Violet family. How many varieties of violets are there in the neighborhood? Have the children ever seen any that are neither yellow, white, blue, nor purple? Let the pupils find out whether some violets are stemless, and whether some have leafy stems. Call attention to the little spur, or nectary, which is visited by the bees and the butterflies. When seen through a lens, the stamens and the pistils will be interesting to the children. What plants are found growing with violets? Call attention to the fact that the pansy belongs to the violet family. In what ways does it resemble the violet, and in what ways does it differ? How many children have seen the wild pansy as well as the cultivated variety?

Violet

Aster. Composite family, to which the daisy, the dandelion, and many well-known plants belong. The children should be sent on a quest for asters, since doubtless there will be many varieties in the neighborhood. With a little help they will see the differences in many of the species, and this will be a valuable preparation for the study of variation in plants. They should note the color of the blossoms, how they are arranged, whether all of them are at the top of the stem, or whether some are along the side. They should note whether the leaves are close to the stalk, whether some have petioles, whether some are clasping, whether they are thin or thick, harsh or smooth, long or broad.

Milkweed. Milkweed family. Milkweed is one of the most attractive plants in the autumn. The children are familiar with the milky juice and with the heavy pendulous flower cluster, which has many insect visitors. They should notice the broad leaves and that both stem and leaves are often downy. Are any smooth kinds found? The boys and girls are familiar with the seed pod, full of white down that carries the flat seeds sometimes long distances from the parent plant.


Aster

Skunk cabbage. Arum family, which also includes sweet flag, calla, jack-in-the-pulpit, and other interesting plants. A large number of boys and girls do not know the skunk cabbage, although it produces one of the most interesting of the very early spring blossoms. Its likeness to jack-in-the-pulpit can be easily seen, since it has a leaflike sheath called a spathe inside of which grows the stout flower stalk, or spadix. The spathe is sometimes very wonderfully colored. If the children gather this plant, they will recognize the odor, which has been likened to that of a skunk. Their attention should be called to the leaves, which, in their early development, are rolled tightly together forming a spike-like structure beside the flower; later these unfold and become very large.

Claytonia, or spring beauty. Purslane family. The claytonia, or spring beauty, is one of the most charming of the flora of this State. Children often call the hepatica or the anemone spring beauty, but the name is most widely given to the claytonia. It is rose color, sometimes white, with deeper coloring in the veining. The children may be encouraged to take a few blossoms to their homes and notice how long they will last. Their attention should be called to the way the blossoms close at night, and open by day. Observations may be made of the little bulblike structure at the base of the leaves and of the kind of flower, whether regular or irregular. Have the children on the lookout for the insects that visit the claytonia.

Poppy. Poppy family. To this family belong bloodroot, celandine, and other plants not so well known to boys and girls. Perhaps the best way to have young persons become interested in this plant is to have them


Milkweed

grow poppies in their flower gardens. They should be encouraged to grow some of the shirley poppies, which have been developed from the common wild field poppy of Europe. True shirley poppies are single; they always have a white base with yellow or white stamens, anthers, and pollen, and never have any black in them. The flowers last longer than those of the common poppies.


Claytonia

The attention of the children should be called to the milky juice of the poppies, to the margin of the leaves, to the nodding buds, and to the color of the flowers. At what time of day do poppies usually open? How many petals has the flower, and how are they arranged? Do all poppies have leaves on the flower stem? The development of the seed capsule should be observed by the children. The seeds when looked at through a lens are most interesting.

Pear. Rose family. In many schools early blossoms of trees are studied by forcing the leaf buds and the flower buds. The children bring twigs into the schoolroom, place them in water, and watch them develop. This prepares the way for observation later in the out-of-doors. In connection with the pear some points of interest are as follows:


Lady's-slipper

The pear thrives best on a rather heavy soil with a friable clay subsoil. The fruit is improved in quality if allowed to ripen indoors. Pears should be picked as soon as they have reached full size, and about two weeks in advance of their normal ripening. Attention should be called to the insect enemies of the pear, the borers and the codling moth. The pear trees in the neighborhood should be observed to see whether any are attacked by blight.

Lady's-slipper. Orchid family. The lady's-slipper with its showy blossoms always has an interest for young persons. Their observation may be so directed that they will notice the stems, whether they are smooth or hairy, how the leaves grow, the shape, the veining,

whether the flowers are solitary, whether the blossom is yellow, whether they find any other colors in these flowers. In what kind of soil do they grow?

The lady's-slipper, or moccasin flower, is becoming scarce in many places, owing to the carelessness with which it is gathered. It is in connection with these rarer blossoms that boys and girls may be taught respect for rights of others, and to guard against the extermination of a species. It may be well to make any observation of these plants in the wood, without gathering the blossoms. Children can easily be taught to overcome the desire to gather every flower they see.

Skunk cabbage

Sweet clover. Pulse family. To this family belong the many forms of clover familiar to the children, and also alfalfa, which has become an important farm crop. Sweet clover is known to all country children, growing as it does along the waysides, and giving pleasure by its fragrance. There are two kinds of sweet clover found in New York State, the large white and the large yellow.

The children will be interested to notice the blossom stem of the sweet clover, which is at first short and packed closely with little green buds, and to watch the stem and the blossoms as they develop. Which buds open first, those lower down on the stem, or those nearer the tip? It will also be interesting to notice the likeness of the sweet clover blossom to that of the sweet pea. The sweet odor comes from the leaves when drying, and not from the blossoms. The sweet clover is frequently visited by honeybees, and beekeepers often plant it in waste places.

Cabbage. Mustard family, which, among other plants, includes mustard, water cress, shepherd's-purse, radish, and turnip. In some schools the children grow cabbage plants in flats to transplant later. This will give opportunity for the teacher to call attention to some facts that will interest the young gardeners.

Cabbage and its close relatives, cauliflower, brussels sprouts, and kale, have all been developed from a wild plant growing on the chalk cliffs of

the English Channel. There are several hundred varieties of cabbage sold by seedsmen in the United States.

The plants need well-drained, well-fertilized soil. The insect pests should be discussed, particularly the cabbage worm. The children should know the life history of this insect. They can find the eggs on the cabbage leaves. The young caterpillars change to chrysalids and then to butterflies.

Carrot. Parsley family. To this family belong poison hemlock, parsley, meadow parsnip, and other plants. In its wild form the carrot is a bad weed known as Queen Anne's lace. The boys and girls may be interested in the carrot in both its wild and its cultivated form. Cultivated carrots are used for the table and for feeding stock. A yellow coloring matter is extracted from the carrot, which is used to color butter.

The children should notice the umbrellalike form of the blossoms of the wild carrot. The seed cluster is also interesting, resembling, as it does, a bird's nest.

WEEDS

K. M. Wiegand

The word *weed* is in general use among all classes of people, but there is perhaps no term more difficult to define. Though most persons have a definite idea about a weed, it will be found that they do not all agree as to what such a plant really is. Plants that are weeds to some persons may be of economic importance to others, or may even be grown as crops. As an example of this, a letter recently came to the Department of Botany at this College, inclosing a plant and containing the request that " this weed " be named. The " weed " was alfalfa. The conception of a weed, therefore, is a more or less personal one. Perhaps a weed is best defined as a plant out of place, or still better a plant that grows where it is not desired. From this point of view, alfalfa growing in a garden where it was not wanted and where it interfered with cultivation was, to the person mentioned, a weed, as much as quack grass or Canada thistle.

It happens, however, that a large proportion of plants that grow where they are not wanted, are plants that very generally have this particular habit; therefore weeds as a whole form a rather definite class of plants. If a person takes pains to find out the native land of the weeds of this country, he will find that most of them are not natives of North America, but of other countries. They are in reality immigrants from abroad. Not more than five per cent of the worst weeds are natives of New York State. Fully eighty per cent have immigrated from Europe, and it has

always been a question why European plants are more prone to become weeds than are plants from other countries. The daisy, the orange hawkweed, the Canada thistle, the mayweed, the chickweed, and many others have migrated from the Old World. Ragweed and black-eyed susan are examples of the few native plants that are weeds. Perhaps the best explanation so far advanced for the predominance of European plants is that the European weed plants come from a region where the native vegetation is more scanty and open than that of this country. When the farmer clears the soil and opens up the country, planting a part to a crop and leaving other portions fallow, exactly the right conditions are produced for these European plants.

Many persons are prone to think of the weed as a very aggressive plant, pushing and crowding the more valuable vegetation until, like the English sparrow, it becomes dominant. This is only true of a few weeds, primarily those adapted to rich soil and those having the habit of spreading by branching stems below or on the surface of the ground. Most weeds, on the contrary, are simply squatters on the soil, occupying space not taken by other plants and readily giving way to the other plants when they become at all aggressive. This will be seen very plainly, if the repopulation of deserted gardens or fields is watched. During the first year after desertion, the field is well populated with a great variety of weeds. During the second year, the variety of weeds has become noticeably less; clover and grasses have begun to grow. By the third year, a fairly well-developed sod of grass and clover has superseded the varied display of weeds of the first year. Within five years, practically all the original weed flora has disappeared. What has happened is that the grasses and the clover, spreading by underground connection, have crowded out the weed flora. In many cases, the weed flora is tolerated only because the soil is too infertile to support the more aggressive economic plants or plants of the native flora. Enriching the soil frequently causes the disappearance of weeds because the economic plants then become more thrifty, and the weeds are crowded out. If more humus is added to the soil, the native vegetation may be stimulated, and the wild plants may replace the weeds.

Weeds have both their good and their bad sides. Before speaking of the undesirable features of these plants, it may be well to point out the fact that some of the weeds are among the most beautiful flowering plants there are, and that if it were not for them the summer and autumn landscape would lack much of its color. A weedy field covered, as it is, with the succession of dandelions, buttercups, daisies, goldenrods, and asters, forms one of the most beautiful pieces of planting that the writer knows.

There is no doubt, however, that the damage to the farmer exceeds the æsthetic value of weeds. They make use of the nutriment and the water in the soil, rob the crop plant of sunlight, and in various ways prevent the full development of the crop. Moreover, the foliage of most weeds is unpalatable or injurious to stock, and forage crops are greatly reduced in value if they are badly infested. Several weed plants are distinctly poisonous. Weeds may produce burs, which lodge in the fur of domestic animals, or seeds, which, when mixed and ground with grain, render the flour unpalatable. In a very great many ways, therefore, the growth of weeds on a farm tends to reduce the income of the farm.

A field of wild carrots in full bloom. A beautiful sight but an evidence of poor farming

The weedy farm is like the untidy and undusted house — it represents untidy and inefficient housekeeping. It is more serious perhaps because it represents a distinct money loss. The modern farmer who looks carefully after the greatest income from his farm and who in the best sense of the word is efficient, will be found to be the farmer who among other things maintains a tidy farm, free from weeds in the fields, along the roads, in fence corners, and around the farm buildings. The farmer who allows his farm to become a hotbed of weeds makes it a distinct menace to his neighbors, for from his infested ground weed seeds will be distributed to his neighbors' farms, and any attempt made by them to maintain clean farms will be very much more difficult. It is easy to see, therefore, that anything that can be done toward bringing the farmer to realize the serious-

ness of the weed pest will be worth while. Anything that the schools can do to make the pupils realize the necessity of clean farming will be valuable work.

What can be done toward the promotion of clean farms? First of all and most important, is the problem of clean seeds. More weeds are brought to the farm in impure crop seeds than from any other source. In fact from three-fourths to seven-eighths of all weeds are introduced on the farm in this way. The realization of the importance of pure seed is rapidly growing. In most States, laboratories are being established where commercial seeds are analyzed and graded according to impurity. The impurities are analyzed, and the seriousness determined. However, much of the common impurity of crop seeds can be determined by the farmer after a little training and experience. In the future, farmers will give much attention to this, and, if they cannot determine the purity of seeds themselves, will send samples to some laboratory for analysis. By the study of common seed adulterations and weed seeds in the school, much can be done toward acquainting the farmer with the common adulterations and the necessity for care in buying seeds.

If, however, the farm has become infested with weeds, something must be done to return it to its original condition. The weeds must be eradicated and to accomplish this is often a much more serious problem than to prevent their introduction at the start. Annual weeds in plowed, hoed, or cultivated crops, are kept in check by clean cultivation. In hay fields, the problem is a more serious one. If few in number, the weeds should be pulled out; a great deal more can be accomplished by prohibiting the spread of new weeds than by later attempting to clean up a badly infested field. Often when the infestation is bad, it is necessary to plow up a field and reseed it with pure seed.

In pasture land the problem of extermination is still more serious and sometimes almost impossible after the weeds have become firmly established. Weeds should not be allowed to grow in fence corners and roadsides, for the seeds will spread over the adjoining fields and make constant labor for the farmer. The school can do excellent work for the farmer by stimulating the realization of the seriousness of allowing seeds to develop The farmer should see that the fence corners and the roadsides are clean, and that newly introduced weeds not seen before in the neighborhood are exterminated. If the weeds are unknown, specimens should be sent to the College in order that they may be identified, and the probable seriousness determined. This will increase the interest of the pupils. The Departments of Rural Education and Botany are always ready to answer queries in regard to weeds and to identify unknown specimens. It is hoped, however, that before writing to either of these departments, every possible

source of local information will be exhausted, for not nearly so much good comes to the pupil if he sends off-hand for information without first having studied and investigated the problem as far as he can. Many schools have taken up the study of weeds and have found that with a little ingenuity on the part of the teacher, it has become a great source of interest to the pupil and of success to the school, as well as a distinct benefit to the community in which the school is located.

WEEDS FOR STUDY IN 1915-1916

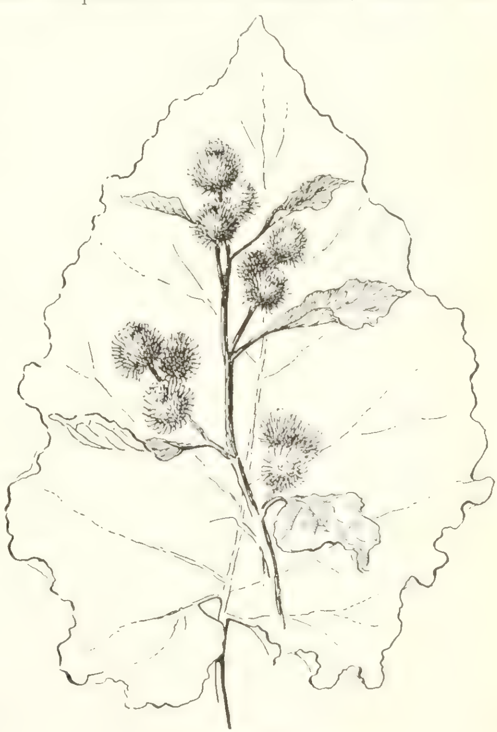
P. J. WHITE

BURDOCK

Burdock is a prominent weed found in all parts of New York State. It is especially common in rich land that has been neglected for a few years. The dooryards of unoccupied farmhouses are often overrun with it.

Burdock belongs to that class of plants called biennials, which live but two years. It spends its energies the first year in becoming well established. A deep, thick root is produced, which bears a cluster of large prominent leaves. No stem is produced the first year.

The second year the plant sends up a branched stem from three to six feet in height. The flowers, which are purple and are produced in dense heads, appear during July and August. These seeds are ripe in September. The clusters of seeds, called burs, are covered with projections, which end in hooks and enable the seed clusters to become attached to passing objects and thus to become scattered. The wool of sheep and the tails of horses are often filled with these burs.



Burdock

Burdocks may easily be destroyed during the first year by cutting them with a sharp instrument just below the surface of the ground. If

not destroyed until the second year, they should be cut off before seeds are produced.

This weed is used extensively in medicine. Large quantities of the roots and seeds are gathered and used as a cure for blood and skin diseases.

WILD CARROT

It is said that the wild carrot is the parent of the garden carrot. If a person pulls up one of these plants and smells it, he will understand why.


Wild carrot

The gardener grows carrot seeds by setting out in the spring carrots that were grown the previous year. After producing seeds the plant dies. This is also the habit of the wild carrots. They do not produce seed the first year. Consequently if they are cut off near the ground two or three times during the second year, their life history is finished.

Wild carrots do not spread from the roots like the thistle, but they produce a great number of seeds. These seeds have been known to live in the ground several years before growing. Therefore wild carrots must be repeatedly pulled or cut off in order to keep the field free from them. They are not troublesome in plowed land, but are common in old meadows.

WHITE DAISY

The white daisy is a perennial; therefore it lives more than two years. The roots are rather shallow and branching. The plant propagates itself to a limited extent by means of underground stems. The seeds of daisies are produced in flat-topped heads, which closely resemble the heads of sunflowers. There is a large number of seeds in each head. White daisies are common in pastures and meadows in New York State, and especially in those that have not been recently plowed. During the last weeks of June and the first weeks of July, many fields are white with daisies. They are cut with the grass at haymaking time, and cured

with the hay. If cut before they are too old and tough, they are eaten by cattle with apparent relish. In pastures sheep and even cows will eat daisies although they prefer grass and clover. If a field once becomes infested with daisies, the only cure is to plow the soil and grow on it a cultivated crop, such as corn or potatoes, for one or two years.

Grass and clover seed used on the farm often contain daisy seeds. The use of weed-infested farm seeds is largely responsible for the spread of troublesome weeds. Good seeds cost a little more, but they are always safer to use.

White daisy

SHEPHERD'S-PURSE

Shepherd's-purse gets its name from the peculiar shape of the seed pods. It is a winter annual, that is, it begins to grow in the autumn and lives over winter, after the manner of winter wheat. On account of this habit it is one of the first plants to flower in the spring. However, not all the plants start in the fall. Many of them begin their growth in the spring or the early summer and live until autumn.

The seeds are very small and are produced in great numbers. They are found in all kinds of small farm seeds and are often sown with them.

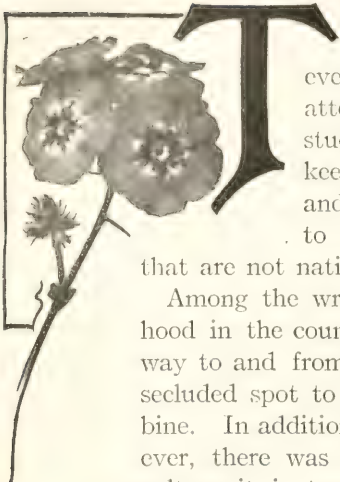
Shepherd's-purse

Shepherd's-purse is found growing under all sorts of conditions, although it seldom causes any serious trouble. The chief difficulty arises when it becomes established in a lawn or other grass land where the grass is too thin. Being an annual it is very easily destroyed in cultivated land. In grass land it may be killed by cutting the stem below the leaves, with a sharp hoe or other tool.

Editors' note.— In addition to the four weeds described, which have been prescribed for study by the State syllabus, many teachers will find it easy and profitable to extend the weed study to include all the more common weeds of the neighborhood. In the fall it is interesting work to make collections of weed seeds.

STUDIES WITH CULTIVATED PLANTS

E. A. White



THERE is much natural plant life that is interesting in every rural district. Whenever possible this should be brought to the attention of children and made a basis for study. Children should be taught to have a keen appreciation of beauty in native plants and flowers, but these may be supplemented to a considerable degree by species of plants that are not native.

Among the writer's most pleasant reminiscences of childhood in the country, is the joy of springtime, when on the way to and from school, he would rush eagerly to some secluded spot to find the first arbutus, trillium, and columbine. In addition to the joy of these flowers of nature, however, there was the old-fashioned garden, neglected as to culture it is true, where sweet williams, daffodils, lady's-delight, and other similar flowers vied with each other for the control of the garden.

This was long before the reign of nature study and school gardens, but among the recollections that have come down through the years is that of one teacher in particular who had a love for plants. It was at her suggestion that the little garden in the corner by the old stone wall was started. Never were there more enthusiastic workers than those who made recess and noontime periods merry, clearing out the brush and stones, digging up the sod, and spading in the fertilizer furnished by a generous farmer in the neighborhood. Those who " carried their dinners " were looked on with envy by those who lived near enough to go home for luncheon. It was counted a special privilege and honor to be allowed to work for awhile in the garden as a reward for a well-prepared lesson. Backaches were forgotten in the joy of outdoor work. At last the ground was prepared, the seeds were planted, and water was brought from a farmhouse near to aid their germination. The developing seedlings were carefully watched, and all too soon for the garden workers came the " last day of school."

Then followed the long summer vacation when no care was given the garden, and weeds ran riot over the plot. All the children were too busily occupied at home to give the garden any attention, and with the fall came a new teacher with no knowledge of plants, and, more unfortunate still, little interest in them. The garden was no more, yet the seed of the love of plants had been sown in at least one country boy's life, to develop

as years went on. This should be a sufficient incentive to encourage much garden work in the rural schools of New York.

One of the discouraging elements in garden work at the school building, is the fact that in so many locations the soil is deficient in plant food. The site for the building has been chosen because of its cheapness, and little attention has been paid to natural beauty or to soil fertility; consequently the problem of outside garden work becomes complex. There is hardly a location, however, that does not have some spot where the soil may be enriched to a degree sufficient to grow attractive flowering plants. Even if it be very poor, there are some plants that may be grown. Herbaceous perennials will give much better satisfaction than will annuals.

Fall is not considered an ideal time to begin garden work, for every one is thinking of the harvest of nuts and fall fruits. Yet there is interesting garden work that may be done even in the fall.

STUDIES WITH OUTDOOR BULBS

Have the children send to some of the prominent bulb dealers for their fall catalogues so that they may study the varieties of bulbs that are adapted to the school or home grounds. Let the children have the feeling of ownership in these catalogues, and encourage them to make a scrap-book from them, showing the different types of bulbs that may be used and different ways in which they may be planted. Bulb dealers are generous with their catalogues, and will usually send them if they are requested. If the catalogue contains colored illustrations, so much the better.

Bulbs are exceedingly valuable for school work, for nutriment sufficient to produce blooms is already stored in the thickened bases of the leaves, which constitute the larger number of so-called bulbs. They are therefore easy to grow. They furnish valuable material for detailed studies and drawings, for the simplicity of their form and structure makes it possible for even the youngest pupil to sketch them. They are inexpensive and may be bought at a price within the means of any group of children.

As soon as school opens in the fall, order the bulbs and give the children a drawing lesson on one of each species, so that they may know what a tulip, a narcissus, or a hyacinth bulb or a crocus corm looks like. Then let the pupils prepare the soil and plant the bulbs.

Bulbs may be planted in a variety of ways, but for the average school yard an informal planting is preferred. Select a secluded corner where the children's play will not be interfered with, and let them spade this carefully and deeply. All bulbs like mellow soil to a considerable depth, for they send their roots rather deeply into the soil. If some well-rotted stable manure is available, this should be spaded in so deep that it will not touch the bulb. While it is true that there is sufficient food in the

bulb to nourish it, nevertheless it will flower to a greater perfection if additional food be easily available in the soil. If bone meal can be had, this should be spaded in, using about a quart to ten square feet of ground area.

There are many kinds of bulbs suited to school grounds, but among the cheapest are narcissus, tulip, and crocus. The narcissi, such as daffodils, jonquils, trumpet and poet's narcissi, are especially good. These are in varying shades of yellow and white. They are truly beloved flowers of the springtime and will add brightness and cheer to the school gardens. They may be bought for from two to five dollars a hundred, depending on the variety, and, when once established, they will flower for several years provided they are allowed to ripen the foliage before it is cut after they are through flowering. Among the best varieties are Empress and Golden Spur, which are large trumpet narcissi, poet's narcissus, the more delicate, smaller jonquils, and double Von Sion. They may be planted in a formal bed; the top of the bulbs should be placed about four inches below the surface of the soil, and the bulbs about four inches apart. If it is desirable, they may be planted directly in the sod, and here they will flower for years, provided they are not trodden on in the early spring just as the new growth is springing up. A hole about seven inches deep should first be dug in the sod with a trowel; about two inches of fine rich soil should be dropped in the bottom and the bulb placed on this. The remainder of the hole should then be filled with fine loam, but the sod should not be replaced. Narcissi are also attractive when planted informally in groups under shrubs.

Tulips are excellent for school grounds, and furnish a wide range of form and color. The price is also reasonable; they can be bought for from a dollar and fifty cents to eight dollars a hundred. Among the best of the early flowering varieties are: Duc von Thol, Joost Van Vondel, Yellow Prince, Keizerkroon, and Sir Thomas Moore. Later varieties of value are: La Merveille, Inglescomb Pink, and Golden Crown. The long-stemmed Darwin tulips in solid colors are especially fine. Tulips should be planted in a similar manner to narcissus, but they are less suited for planting in an informal way in sod.

Hyacinths are among the more expensive bulbs, and they are not well adapted for outdoor planting on school grounds. They are more formal and better suited to symmetrical beds.

Bulbs for border plantings are: grape hyacinth (*Muscari botryoides*), scilla, crocus, and snowdrop. The crocus and the snowdrop are among the earliest spring-flowering bulbs and are through blooming long before daffodils and tulips bloom.

After the bulbs are planted, the beds should be left uncovered until the

ground is solidly frozen. They should then be covered with about four inches of leaves, and boards should be laid over the leaves to prevent them from blowing away during the winter. These leaves should be removed as soon as the first warm days of spring start the young gardeners from the schoolroom. The advantage of using bulbs in school yard planting is that the full season of planting, growth, and flowering, comes within the school year.

A field of daffodils

STUDIES WITH INDOOR BULBS

Not all the bulbs should be planted in the ground for spring blooming. Each child should have a few to watch indoors, and these will brighten the schoolroom during the early spring months. Tulips, paper-white and other narcissi, roman and dutch hyacinths, oxalis, and freesias are especially good for this purpose.

When the children are planting the bulbs outdoors, prepare some soil that is a little richer than that used in the outdoor beds. If earthen pots cannot be obtained, do not hesitate to use tin cans, especially coffee cans, for later these may be covered with various materials, which add

to their attractiveness. Oftentimes a crude receptacle accentuates the beauty of the plant or the flower. Be sure that there are openings in the bottom for drainage, and make these by driving nails through the bottom of the tin cans if necessary. Put considerable drainage material, such as broken stones or small cobbles, in the bottom of each receptacle. Bulbs must have a well-drained soil. Place sufficient soil above the drainage material so that there will be plenty of room for root development; then set the bulb lightly on this and fill around it with soil. Cover the top of the bulbs slightly, but leave about half an inch of space from the top of the pot in order that there will be room for water later. Plant the bulbs in the receptacles in such a manner that they will be attractive when they bloom. Hyacinths are often grown singly in a pot, but all other bulbs are generally more effective if there are three or four of the same variety in one receptacle. The crocus and the grape hyacinth are attractive when grown in this way, provided six or eight are planted closely together in a pot.

After the bulbs are planted, water them so thoroughly that there is no question that the water has soaked to the bottom of the soil in the receptacle. Do not neglect this, for on the moisture content of the soil depends in a large measure the success of root development. This is essential for the production of an attractive flower spike. Select a protected spot for storing the bulbs until root development has started. With the exception of freesias and oxalis, all bulbs should be stored in a cool, dark, damp spot so that they will develop a strong root system before the top develops. An outdoor location is best, but they may be stored in a cellar if the conditions are favorable. The majority of cellars, especially in school buildings, are too warm and dry. A protected corner of the building is ideal. First level the soil and if possible place a layer of coal ashes about two inches thick for the pots to stand on. This prevents earthworms from getting into the soil, and while these do not feed on the roots, they open air passages through the soil, which dry out the feeding roots.

Place the pots of bulbs closely together, after having each child label the bulbs he or she has planted. There is a pride among children in individual work, and this should be fostered in every way possible. Shovel about three inches of soil over the pots, covering them sufficiently so that they will not freeze, and then cover this soil with about four inches of leaves. Place a few boards over the leaves to hold them in place. Here the bulbs are to remain until a strong root system has developed. The paper-white narcissi and the roman hyacinths should be placed in a group by themselves, for they may be brought in the schoolroom by the middle of November. The other bulbs should not be brought in before the middle of January, and if they are left until the first of February, the later development will be more satisfactory.

To maintain the interest in plants until those kinds that are developing roots are ready to be brought in, each child should have a few freesia and oxalis bulbs. These should be potted in the same way as other bulbs, but after they are watered thoroughly, they should be placed at once in a window. Here they will develop and flower in from six to eight weeks. Chinese sacred lilies also may be obtained cheaply. These grow better in water than in soil. Place the bulb in a bowl and hold it firmly in place with clean, attractive pebbles; then fill the bowl with water. Place the lily in a window where there will be sufficient light to produce a sturdy, compact growth. If the light is not intense enough, the plant will make a weak, spindling growth, which is not sufficiently strong to hold the flower cluster upright.

Poet's narcissi naturalized in sod

When the outdoor potted bulbs are brought into the schoolroom, they should be placed in a shaded spot or covered with an inverted flowerpot for a few days in order to draw the flower stem well above the foliage. If a flowerpot is not available, a cone of thick paper may be used. After a few days the pots of bulbs may be placed in the window.

WINDOW GARDENING

One of the problems of the country school is to care for plants from Friday night until Monday morning. When fires are kept continuously and a plant-loving janitor is available, the solution of the problem is simple; but with no fires and no janitor or one who will not bother with plants, the question is serious. In a room having only north light, plant growing is difficult, yet here a study of the species suited for diminished light will suggest many plants that may be grown. There are few flowering species, however, that are adapted for such an environment.

As soon as the bulb planting season is over, work may be commenced with window boxes. These are usually more satisfactory for schoolrooms than are potted plants, for, as a rule, potted plants need more attention and are more susceptible to neglect, lack of water, and the like.

Window boxes should be made of some durable material, such as hemlock or cypress boards. The children should be encouraged to make them,

but the lumber should be sawed in the proper sizes so it may be put together easily. The boxes should be about ten inches wide, eight inches deep, and of any length desired. They should be so placed that the top of the box will come about even with the window sill. After the boxes are in place, they should be painted a shade of green that will harmonize with the foliage of the plants. These boxes should be the winter gardens. Similar boxes may be placed outside the windows, and if filled with small hemlock and pine trees, the winter aspect will be a cheery one.

A few well-berried plants of Japanese barberries or the native black alder (*Ilex verticillata*), add to the attractiveness of the winter outdoor window boxes, and between them may be planted the evergreen shield fern (*Aspidium marginale*) and the so-called Christmas fern (*Polystichum acrostichoides*).

The soil for the inside boxes should be rich; a medium light garden soil well enriched with one-third thoroughly rotted cow manure, makes an excellent soil. There should be some stones in the bottom of the boxes to insure perfect drainage. After the soil and the manure are well mixed, the boxes should be filled with the compost. Some of the inside boxes may be used for planting seeds, and some for larger plants propagated by cuttings. One difficulty in satisfactorily growing seedlings in window boxes is that the seed is sown too thickly and too many seedlings develop, so that the resulting plants are weak and deficient in flowers. If possible, it is best to transplant the seedlings once or even twice, so that strong, healthy plants may result.

For the seed boxes it would be well to have a border of some established vine to give a decorative setting for the seedlings. In almost any locality it is possible to get considerable inch plant, or wandering jew (*Tradescantia fluminensis*), and this may be readily rooted by placing it for a week or two in glass jars filled with water. It is interesting for the children to watch the roots develop from the nodes of the stem. This may furnish material for a lesson on the formation of roots from various parts of the stem. Seeds of climbing nasturtiums may also be inserted in the soil along the borders of the boxes to form trailing vines. Another attractive combination may be made by sowing a border of trailing sweet alyssum, alternating here and there by trailing lobelia. The border of blue and white flowers is very effective. Other seeds that may be started in the boxes and that will later give attractive flowering plants, are ageratum, bachelor's-button, dwarf nasturtiums, African golden daisy, California poppy, marigolds, forget-me-nots, petunias, scarlet sage (*Salvia splendens*), butterfly flower (Schizanthus), stocks, and verbenas. It takes many of these a long time to germinate, develop, and flower; therefore unless it is desired to demonstrate to the children the successive

stages in plant development, it is better to obtain larger plants for the window boxes.

For quicker effects, it is possible to take plants from the garden and plant them in window boxes. Geraniums are very satisfactory when treated in this way; petunias, heliotrope, and salvia are also satisfactory. Just before frost in the fall, these plants may be carefully lifted from the soil with a garden spade. Most of the soil is shaken from the roots, and the plants should be severely cut back so that little foliage is left on them. They should then be planted in the center of the window boxes and watered

A border planting of tulips

thoroughly. They are rather unsightly for the first few weeks, but soon young leaves appear, and in a short time the stems are covered with a mass of green foliage. Flowers soon develop. Old plants are much more prolific of bloom during the winter than are those propagated from cuttings. Usually some liberal-hearted flower grower may be found in every community, who will gladly contribute the plants from his garden for this purpose. These will form a setting for the window boxes, and among them freesia bulbs may be planted. When the outdoor potted bulbs have developed a strong root system, they may be carefully rapped from the pots and planted in the window boxes. Here they will flower much better even than in pots. Care should be taken not to injure the root system severely in transplanting.

It is always well to root some cuttings in the schoolroom, so that the pupils may see how new roots develop on plants. Besides the tradescantia mentioned, geranium, coleus, heliotrope, salvia, petunia, and other garden flowers may be easily propagated by cuttings. Before frost has injured the parent plants, terminal shoots should be cut about two and one-half inches from the end. A smooth cut should be made with a sharp knife straight across the shoot. If made just where a leaf is attached to the stem (node), the cutting will generally root better. Most of the side leaves should be carefully removed to reduce the leaf surface; only about two leaves should be left at the top. If the leaves are large, it may be necessary to clip the edges. The cuttings should then be put into a bottle of water, and roots will usually develop.

A better and surer method of rooting cuttings for the window box is to plug up the hole in the bottom of a seven-inch pot and fill it with sand. A four-inch pot with the hole in the bottom tightly sealed, should be inserted in the sand contained in the seven-inch pot. The four-inch pot should then be filled with water; enough moisture will percolate through this porous pot to keep the sand in the seven-inch pot constantly saturated. The cuttings should be inserted in the sand around the inside of the seven-inch pot, and should be shaded for a few days and then put into full sunlight. When roots about one-half inch in length have formed, the cuttings may be placed in the window box. The top of the rooted cutting should then be pinched out in order to cause the cutting to branch and make a stocky plant.

If established plants of abutilons, ageratum, begonias, petunias, *Asparagus sprengerii*, salvia, or vincas, can be obtained in the fall, the window boxes will become attractive more quickly. However, the joy of growing the plants from the start will be lost.

Attractive window boxes for north windows are a more difficult problem. Foliage plants must be largely adopted, for few flowering plants are shade enduring. Nearly all kinds of ferns are excellent, and if such plants as tradescantia, the umbrella palm (*Cyperus alternifolius*), the aspidistra, rex begonias, and the various forms of asparagus are available, the success of the shady window box is assured.

The window garden need not be given up, however, even if the plants mentioned are not available. As has been before stated, the children should be taught the beauty of the native material. During the last winter, a student at Cornell has been testing the adaptation of native plants to growing indoors. His investigations have proved that such flowering plants as spring beauty (*Claytonia caroliniana*), marsh marigold (*Caltha palustris*), liverleaf (*Hepatica triloba*), columbine (*Aquilegia canadensis*), showy lady's-slipper (*Cypripedium spectabile*), yellow lady's-

slipper (*Cypripedium pubescens*), wake robin (*Trillium grandiflorum*), dog-tooth violet (*Erythronium americanum*), and many other native species, develop and flower perfectly under house conditions. Every country boy knows the habitat of these woodland flowers, and Mother Nature has such an abundance that a few taken from the woodland will not exhaust the supply. The plants should be gathered from the woods before the ground freezes, and potted in some sort of a receptacle. They should then be allowed to freeze solidly several times before they are planted in the window boxes. A moderate temperature and a liberal supply of water, will then cause them to develop rapidly, and the results are most gratifying. As a rule, these plants adapt themselves better to the varying temperatures of the schoolroom than do the more tender species from the garden and the greenhouse. Most of the native ferns are adapted for growing in the window box, especially where there is only northern light.

It is not expected that all the foregoing suggestions will be carried out in any one school. Some conditions may permit only outdoor bulb planting; in other locations outdoor window boxes alone may be feasible; while in others, indoor window gardening or work with bulbs may form the basis for plant study. In or about every school in the State there should be some ornamental plant life, and the children should be taught the value of the beauty of simplicity.

The tulip bed on the school grounds

TREE STUDY

THE EDITORS

AS the State syllabus has not outlined any special tree work for 1915–1916, in this leaflet is presented some material in which teachers have expressed an interest and which is not included in the four-years work outlined in the syllabus.

As a preliminary step to the tree study, teachers will find it helpful to read carefully the article by Professor Moody on "Forestry in the Rural Schools" (page 1343). There is no more interesting and important study than that of the native trees, both from the standpoint of natural history and from that of their economic value. When one considers the place that they occupy in the landscape, the fact that they will grow on land unsuited for other purposes, the service that they render in regulating the flow of water in the streams, and the value of the wood for fuel and lumber, it is easy to see the pleasure and profit that greater familiarity will afford.

Trees are available for study the year round, and present many varying phases as they pass through the winter period and the stages of developing foliage, flowers, and fruit. No piece of work in the rural school will be found to be of greater value than a thorough study of the trees in the neighborhood. A report has been received from a teacher who, one morning in the early springtime, told the children to take pencils and pads and follow her single file. She led them on a field trip, which she had previously planned to include the largest number of different kinds of trees in a short distance. She paused for a moment under each of eighteen species, and requested the children to write the name of the tree opposite a corresponding number. There was no interchange of opinions among the children, the trip was completed in a short time, and the results were discussed after returning to the schoolhouse. The children found (as was revealed in their letters accompanying the one from the teacher) that they knew from eleven to eighteen of the trees visited. One child knew all of them. Those who were not able to identify one or more trees, were asked to make a special study during the following week of the species not known, so that in the event of another test of similar nature they would not fail. This work was worth while, and it can be developed in any rural school. As the children become familiar with the more common species, the range may be extended until, finally,

every pupil can recognize and distinguish the forty, fifty, or more kinds of trees growing in the locality.

In connection with the study of trees, it is desirable, as well as interesting, to make a collection of tree specimens that will show for each species the young and the old bark, the leaves, the flowers, the fruit, a cross section, and a longitudinal section of the wood. The different parts from a given tree may be mounted on a neat background and preserved for exhibition and study. Further information regarding tree mounts will be found on page 1387.

One caution is necessary and concerns the matter of respect for property, which should be taught in making the tree collections. No tree should be mutilated or destroyed in order to secure specimens of wood or bark. The length of time it takes to grow a tree may be emphasized. There are many opportunities, if the children are on the lookout for them, to secure specimens of wood and bark when trees are cut down by the owners or from the stumps of trees that have been cut down in the past.

In addition to the study of trees from the natural history point of view, it is desirable to consider, with the boys and girls, the importance of properly caring for the farm woodlot in order that the greatest amount of wood shall be grown in the shortest possible time. There are many uses for wood on the farms aside from its value as fuel, and these uses may be considered when the treatment of the woodlot is discussed.

FORESTRY IN THE RURAL SCHOOLS

Frank B. Moody

In the new educational movement to have children in the rural districts taught in terms of their daily life, agriculture, domestic science, and other practical subjects are being introduced into school work. Some educators who are deeply interested in having boys and girls take an interest in all phases of agriculture consider that a little forestry, such as the care of the woods, might have a place; that side by side with instruction in the care of the orchard and of the shade trees about buildings and along highways, the raising of a useful crop of wood might give opportunity for educational work.

Forestry experience teaches the following principles:

1. Certain phases of forestry, such as the planting and the care of the woods, are a real part of agriculture, since they have to do with raising a crop from the land. The methods are simple, and the results are even more certain than those of other lines of agriculture. Forestry can make the land profitable. It is especially suited to this country, in so far as it is developed with less labor and can make a larger income from poor lands — such as a rough and mountainous country — than any other form of

farming; and it has served in Europe to prevent millions of acres from becoming useless, barren waste.

2. Forestry helps to regulate the distribution of water and to lessen the rigors of climate, and in so doing it aids all forms of agriculture. It cares for nature's greatest means for beautifying the earth.

3. It provides a local supply of timber and protects the farmer and the townsman against exorbitant prices of importation; it stimulates local industries, and thus creates a local market for produce.

4. It is not a new and untried industry, but has been in actual practice for more than a thousand years and has not failed in any locality where it has been correctly and consistently practiced.

A plantation of Norway spruce, twenty-two years old

5. It is of particular interest to farmers, since it adds to the value and the beauty of the farm and to the safety, the comfort, and the income of the farmer; and it does all this without great expenditure of capital or labor.

6. It is well suited to state, county, and township ownership and enterprise, and could well be utilized in this State, as it is in the Old World, to maintain larger tracts of inferior lands in useful condition and at the same time lessen the tax burden in the very locality where the taxes weigh heavily.

To sum up, then, the forest is needed everywhere because people must be supplied with wood and timber; it makes the best crop on all rough and poor lands; it regulates water distribution and local climate; and it beautifies the land. The question now comes, What can the rural school do in forestry? This question has not yet been answered, nor will it be until much thought and experiment have developed good pedagogy of forestry. All teachers in rural schools can help in this, and it is hoped that some useful and interesting work will result this year. The following are a few suggestions:

1. Help the children to organize what they already know of trees and woods, and by demonstrations help them to knowledge that will be more definite and exact. Most farm boys know an oak from an elm, but the knowledge is not clear, exact, and reliable as it may be. A few questions,

and a simple comparison of leaf, fruit, and the like, will make a good beginning in this work.

2. The boys and girls should be encouraged to talk about the woods — where they are, to whom they belong, how large they are, what is being done with them. The children will begin to see the woodlot in a new light. They will realize that some one cares about the trees, and they will bring to the schoolroom not only specimens, but also observations and information.

3. Economic interest in forestry may be stimulated by some suggestions, such as the following: How logs are taken to mill; to workshop; the value of this to the farmer and to men in mill and workshop; how the workers spend their money to buy produce, hay and feed, provisions for their homes, and the like. Let the pupils follow up these considerations to a discussion of big markets, transportation, and general manufacture, and lead them to see what timber and the products of the woods mean to people.

Help the boys and girls to realize how the forest influences rainfall; the springs and the rivers; how it keeps the land from gullying and washing; how it breaks the force of cold and drying winds, and therefore helps the farm crops. Also develop an appreciation of trees and shrubs and woods as the great decorative feature in the landscape.

The economic losses due to waste land will be of value in discussions of forestry. Any farm boy or girl readily appreciates that there is loss every time an acre of land is allowed to lie unused during a growing season, and that this loss is real, immediate, and irredeemable, and may be measured by the value of the crop that the land could grow. The amount of this loss in the vicinity and township leads up to a few figures regarding the county and the State, and brings home the importance of this subject.

4. In many ways the teacher can help the pupils to realize the pleasure that comes from trees and woods — the shade and shelter about the house and on the highway, the place for camping, berrying, and nutting, for finding wild flowers, birds, squirrels, rabbits, and other interesting animal life, for fishing and other outdoor experiences. The children may also be taught that it is a duty to try to keep the farm, the township, and the county as beautiful and homelike as possible, and that the trees help in this.

5. The pupils should be encouraged to gather tree seeds, to plant forest and shade trees and shrubs, and to trim, thin, and protect them; these processes are all so intimately connected with farm work that very little teaching, in the ordinary sense, is required. Every farm boy of twelve knows how and where to gather a few nuts, acorns, seeds of maple, ash, and the like. He also knows how to sow or plant seeds, and how to

place a small tree so that it will grow. He may be taught that with a spacing of four feet by four feet these trees, before long, will suffer if left alone; that they will crowd one another, and pinch and cripple their crowns; that the weaker will die off; and that it is better to thin such a thicket rather than to leave too many trees to injure one another and retard the growth of the entire stand.

The matter of protection of trees is important. The children know that trees suffer if mutilated, and that a forest fire is always serious. When children learn from teacher and parents about the value of the woodlot, they will not be so likely to commit vandalism in the woods.

THE OAKS OF NEW YORK

(For special study)

JOHN BENTLEY, Jr.[6]

The genus Quercus, which consists almost wholly of trees, comprises about three hundred species. Most of them attain a great age and are very widely distributed over the American continent. There are nearly fifty different species of oaks in the United States, and if the varieties, some of which are indistinct, are also included, the list would be so long that it would be discouraging to try to learn all the kinds. Fortunately one can learn to distinguish those that are common in New York. Although there are some fifteen or sixteen kinds of oaks reported as growing in this State, only eleven are described in this article. The others are rare or of very local occurrence. It will be necessary to have not only the leaves but the acorns, and sometimes the twigs and the winter buds, in order to distinguish all of the oaks described.

In the first place the oaks can be divided into two general groups: those that have acorns maturing in one season, known as the white oaks; and those that have acorns maturing in two seasons, known as the black oaks.

White oak group	Black oak group
White oak	Black oak
Swamp white oak	Red oak
Post oak	Scarlet oak
Chestnut oak	Pin oak
Bur oak	Scrub oak
	Blackjack oak

A further distinction between these two groups is that the black oaks have leaves the pointed lobes of which are tipped with bristles, while the lobes of the leaves of the white oaks are smooth and rounded. Between

[6] Revised by Frank B. Moody.

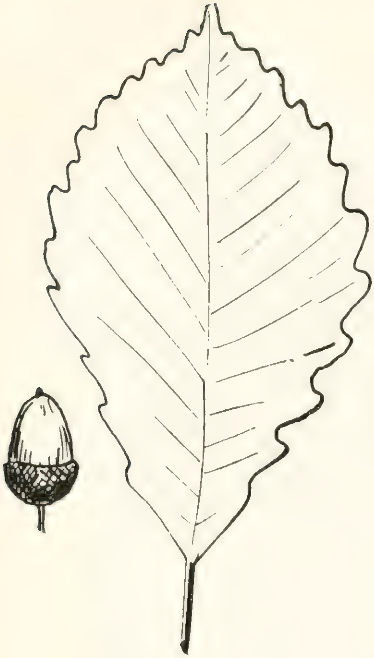
the lobes are indentations, which botanists call *sinuses*. These sinuses are variable and are often a help in identifying the different species. The following is a key for identifying the different species of oaks. The use of the term sinus in this key should be noted.

White oak

KEY TO THE COMMON OAKS OF NEW YORK

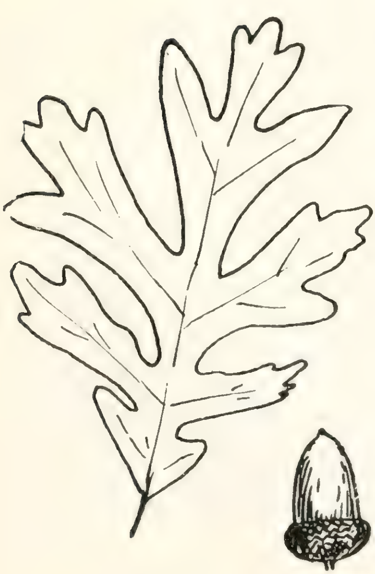
A. Acorns maturing in one season; leaves with rounded lobes and rounded sinuses .... WHITE OAK GROUP

1. Margin of leaf merely wavy-toothed, not cut so deeply as to be called lobed
   (a) Margin finely wavy-toothed.................Chestnut oak
   (b) Margin coarsely wavy-toothed, more pointed than in chestnut oak ....Swamp white oak
2. Margin of leaf distinctly lobed; one pair of broad sinuses cutting nearly to the midrib of the leaf, so that the upper part of the leaf is much heavier and broader-looking than the lower part. Acorn with a mossy cup ....Bur oak, or mossy-cup oak
3. Margin of leaf distinctly lobed, sometimes very deeply cut, with broad sinuses
   (a) Lobes usually seven or nine in number; acorn pointed; cup enclosing not more than one-fourth of the nut........ White oak

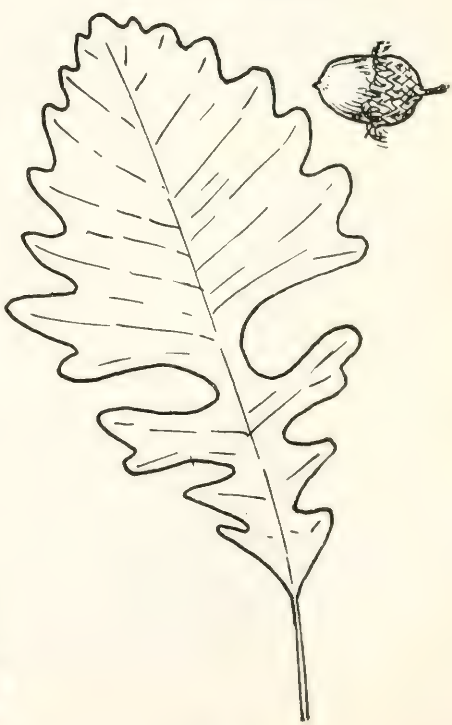


Chestnut oak

Swamp white oak

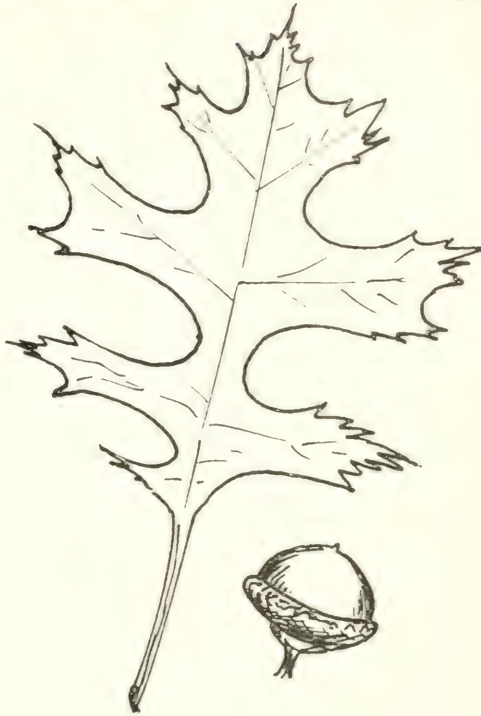


White oak



Bur oak

Blackjack oak



Pin oak

Red oak

Scarlet oak

(b) Lobes usually five in number; acorn not so pointed, and cup enclosing from one-third to one-half of the nut. . . . Post oak

AA. Acorns maturing in two seasons; leaves with pointed, bristle-tipped lobes and rounded sinuses. . . . . BLACK OAK GROUP

1. Leaves green on both sides
   - (a) Sinuses very broad, broader than the lobes between them
     - (i) Acorn small and flat, the nut almost hemispherical. Usually found growing in moist, rich soil on the banks of streams or the borders of swamps..Pin oak
     - (ii) Acorn slightly larger and more nearly round. Kernel whitish. Usually prefers dry soils on ridges and well-drained situations. . . . Scarlet oak
   - (b) Sinuses usually not so broad as the lobes between them
     - (i) Leaves thick and firm; dark green, lustrous above; more or less fuzzy on the underside. . Black oak
     - (ii) Leaves thin and firm; dark, dull green above; on the lower side usually smooth, or with fuzzy hairs near the veins only. . . . . Red oak

       Or by their acorns these two oaks can be distinguished as follows:

       Cup very flat, saucer-shaped. . . . . Red oak

       Cup not so flat, enclosing nearly half the nut. . . . . Black oak
2. Leaves green above, covered with silvery down, below; usually five lobed. . . . . Scrub oak
3. Leaves green above, gray-green or yellowish green and scurfy on the lower side; usually with only three lobes. (Found in New York State only on Long Island). . . . . Blackjack

As a family the oaks are very useful; but there is a great difference between the several species, especially as to rate of growth, hardness of wood, and usefulness of wood. In general white oaks are harder and more durable than black oaks, and when a carpenter or a woodworker wants a piece of very hard, heavy, durable wood that will hold its shape without shrinking, warping, or checking, he will be likely to choose a piece of white oak in preference to any other kind of oak. In the market, swamp white oak passes for white oak, and sometimes a small quantity of chestnut oak may be included with true white oak; but the wood of chestnut oak is not so strong and good as that of true white oak.

In form the oaks present a great variety. White oak growing in the woods has a long, clear stem for perhaps fifty or sixty feet and reaches

a height of over one hundred feet. In the open fields, where it has plenty of room to develop a big crown, the form is likely to be short and round-headed, with a stout, much-branched trunk. The oak always presents an appearance of great strength and sturdiness; the winds of winter have little effect on its tough, strong branches, but these are frequently gnarled and irregular as a result of exposure to storms. The acorns of the white oak will germinate soon after falling in autumn if conditions are favorable; but because so many acorns are eaten by squirrels, and because so many others do not find the right conditions of soil and moisture, only a small number succeed in growing.

Red oak

Although a widely distributed tree, the white oak is found most commonly on good moist soil in rich bottom lands or in protected hollows. In the country adjacent to the Ohio River valley the white oak finds the best conditions of soil, climate, and rainfall. It will grow also on rather dry, stony soil, but it never reaches such good size under these conditions.

Of the black oaks, the common red oak is the most desirable because of the rapidity of its growth and the general quality of its wood. Although not nearly so strong as white oak, it is heavy and rather hard and is useful where great strength is not required. The grain of the wood is rather coarse, and it never seasons so well as does the white oak. In form the red oak develops a very large, wide-spreading crown, with a number of large branches; but it almost always has a well-formed stem,

making possible the cutting of good saw logs from it. The red oak grows farther north than any of the native oaks, and is not nearly so particular as the white oak as to quality of soil.

The common black oak is of relatively little importance. The tree does not grow to such good proportions as the red oak, and the wood is poorer in quality. It is used for railroad ties and rough timbers, but it is not so durable as the red oak.

The scarlet oak is a much smaller tree than either the red or the black oak and it is almost always found growing on sandy or gravelly soils. Its form is not good enough to make it an important timber tree.

An oak tree in summer foliage

The pin oak is a very graceful tree shaped like a pyramid with a straight trunk and numerous slender branches. It is one of the best oaks for ornamental purposes.

The scrub oak and the blackjack oak, which are really little more than shrubs, cover vast areas that have been burned over and are often the obstacle to having better trees on this kind of land. It is better, however, to have them growing on the land than to have nothing at all, for in the latter case the soil might be washed away by heavy rains; and perhaps it will be possible to start more desirable kinds of trees where the scrub oaks are now growing, taking advantage of the protection that they afford.

THE PINES OF NEW YORK

JOHN BENTLEY, Jr.

In the winter months, when most of the forest trees are leafless, the firs, the spruces, and the pines, with their dark green foliage, are a cheerful sight. It makes one feel, somehow, that after all the woods are not lifeless in winter, and that there are some trees bold and hardy enough to withstand the snow and the cold. Pines are particularly noticeable, because there is more motion and life in their foliage than in the stiff, rigid foliage of spruces and firs. Then, too, pines are more familar to most of the boys and girls in the State, because spruces and firs belong to the cold climate of the mountains.

There are five pines that are native to New York State, besides several others that may be found occasionally in the parks. The five native trees are (1) the white pine, (2) the pitch pine, (3) the red, or Norway, pine, (4) the jack pine, and (5) the Jersey scrub pine. The last two are not very common, however, and generally only the three first mentioned will be found.

The pines as a group are marked by three characteristics, which all boys and girls should notice first of all. They are (1) the needle-shaped leaves, borne in clusters of two, three, or five needles; (2) the cones, in which the little seeds are borne; and (3) the wood, which always contains more or less pitch, or resin. These characters distinguish the coniferous (cone-bearing) trees from the broad-leaved trees. The term *evergreen* should not be applied to the pines, the spruces, and the firs, because there are other trees, such as the holly and the live oak, which retain their leaves throughout the winter and are just as truly evergreen as is the pine or the spruce. Then there is the larch, which bears cones and yet sheds its leaves every year. The leaves of the larch are needle-shaped, it bears cones, and there is some resin in the wood; therefore it clearly belongs to the same family as do pines, firs, spruces, and hemlocks. In order to avoid all confusion, therefore, it is suggested that pupils learn to call all cone-bearing trees conifers, which means cone-bearers. The others may be called broadleaf trees; this will properly include the live oaks and the holly, and will do away with the confusing term *deciduous* (leaf-shedding) trees. Another term that is frequently heard is *hardwoods*. As generally used, this term means the broadleaf trees, although there are some conifers with very hard wood — yellow pine, for example — and some hardwoods, or broadleaf trees, with very soft wood, such as the poplar and the willow. The use of confusing terms should be abandoned, and the terms conifer and broadleaf, while sounding a little strange at first, will express the meaning more closely.

The pines are nearly all of great value because of their wood, which

is strong for its weight, straight-grained, and easily worked — that is, carpenters have little difficulty in planing and shaping it to their purposes. Some pines have very hard, heavy, resinous wood, as the Southern yellow pine; but the Northern white pine is light and soft and contains only a moderate amount of resin. The white pine was formerly the most important timber tree of all the Northeastern States, and many millions of board feet of white pine have been cut from the forests of New York within the past century. It is still considered a very valuable tree, and lumbermen are always glad when they can find any white pine to cut, because they know that it will bring a good price in the markets.


White pine needle cluster

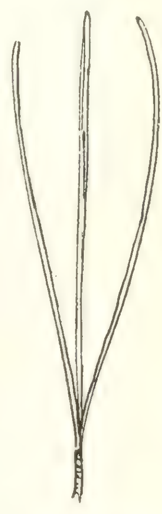
The white pine is a tall, straight-trunked tree, often reaching a height of one hundred and twenty-five feet in the dense forests of the Adirondack Mountains. When growing in the woods the trunk is frequently clear of all branches for sixty or seventy feet; but when grown in the open, where it has plenty of room, the crown is broad, with many limbs growing to within fifteen or twenty feet of the ground. Under these conditions the tree never grows very tall. The lumberman likes best of all the tall, straight trees of the forests, for they yield fine, straight-grained lumber with few knots.

The white pine can be distinguished from the other pines of this State by the needles, which grow in clusters of five. If the foliage of a pine tree is examined it will be seen that the needles, instead of growing singly, grow in bundles, or clusters. In the white pine there are always five needles in a cluster. The individual needles are from two and one-half to five inches long, slender, flexible, bluish green, with a fine white streak. Some cones may be found growing on the tree, or those that have fallen from the tree and are now lying on the ground may be examined. The white pine cone is about five inches in length, is usually slightly curved, and is slender, rarely exceeding an inch in thickness. It is free from spines, or prickles. If a dry cone has been picked up the seeds have doubtless been shed and scattered; but if a fresh one can be found with seeds in it, it may be seen how each seed is provided with a thin wing, which enables the wind to blow it for long distances.

The pitch pine is probably the second commonest pine tree of this State. It is generally found growing on very poor soils, where only the hardiest trees or shrubs will thrive. This tree can grow in these poor situations because of its thick bark, which is often two inches thick at the base of the tree, and because it can resist fire much better than can the white pine. It is not nearly so neat in appearance as the white pine;

its branches are irregular, the trunk is not so tall and straight, and the old cones frequently hang on the tree for years. The foliage is stiff and the needles are borne in clusters of three; this at once distinguishes it from the white pine. The needles are a dark yellow-green instead of a blue-green. The cones are short and stout, about two or three inches long and two inches thick, and each cone scale is armed with a prickle. There is not the slightest resemblance between the white pine and the pitch pine, in either needles, cones, or bark; and if the wood is examined after the tree has been cut, no resemblance will be found there. The wood of the pitch pine is coarse-grained, full of pitch, and not adapted to the fine work for which white pine is used. Indeed, the wood of pitch pine is of little value except for coarse, rough lumber and for excelsior.

The red pine, or Norway pine as it is frequently called, is a tree that is not found in many parts of this State. It is common only in the Adirondack region, where it grows on light, sandy soils and has plenty of sunlight. It may be found occasionally, however, in other parts of northern New York. It can be distinguished by its long, flexible needles (four to six inches long), which are borne two in a cluster. The cones are from two to two and one-half inches long and have no prickles. Taking the cones and the needles together, there is no danger of confusing this tree with the other two pines mentioned.



Pitch pine needle cluster

The red pine reaches a height of seventy-five or eighty feet. The wood is harder than that of the white pine, yet like white pine, it is not durable in contact with the soil. Because of its hardness it is not so valuable a timber as white pine, but the red pine possesses the great advantage of being a tree that will grow well on land too poor to produce a satisfactory crop of white pine. It rarely makes close forests, because it is a tree that demands a great amount of light for its growth. Red pine trees are never found in large numbers together, at least in this State, but are found mixed with other trees, especially at the edge of lakes or in openings throughout the sandy stretches of country that are common in the Adirondack Mountains.

The jack, or scrub, pine is not frequently seen in this State except in dry, sandy, barren soils in the northern part. It is usually a small, scrubby tree, with irregular branches, and of such poor form that it is practically worthless for lumber. The leaves are bluish green, covered with a gray bloom, and about two inches in length. They are borne in clusters of two, are twisted, and have a tendency to spread apart. The cones are

small, rarely more than two inches long, and are armed with small prickles, which, however, may drop off.

The Jersey scrub pine is still more irregular and worthless as a lumber-producing tree. It grows in poor, sandy soil and is found growing wild only on Long Island. The needles are borne in clusters of two and the cones have prickles.

TREES TO BE RECOGNIZED IN 1915-1916

FRANK B. MOODY

AMERICAN HOP HORNBEAM

American hop hornbeam, leaves and fruit

The American hop hornbeam, or ironwood, is a small, slender tree from twenty to fifty feet high and is almost always found growing under other trees in the forest. Because of their close resemblance, it is often mistaken for the elm. However, the hoplike fruit clusters afford a ready means of identification. (See illustration.) The wood is very strong, hard, and durable, and is used for fence posts, tool handles, and mallets. Because it can withstand shade, the hop hornbeam is found throughout the entire North Woods region, and often makes up quite a portion of the lower tier of trees. The relatively small size and the slow growth of the tree, render it unsuited for forest planting, although it is adapted for planting in lawns and parks.

ARBOR VITÆ

The arbor vitæ, also known as the white cedar, is one of the most valuable trees for ornamental purposes and for hedges. The flat spray of the arbor vitæ distinguishes it from other evergreens. Unfortunately the name white cedar has become attached to this tree, thus confusing it with the true cedar. It may be distinguished from the latter by its more flattened and larger sprays, which are also more fan-shaped. The fruit of the arbor vitæ is oblong with thin oblong scales, while that of the white cedar is spherical, with thick, shield-shaped scales. Arbor vitæ is used for fence posts, rails, shingles, ties, spools, woodenware, and in building boats. It is usually found growing in low, swampy places with tamarack and spruce, but it often occupies high, dry land.

ASPEN

The American aspen, also known as quaking aspen, trembling aspen, popple aspen, and small-toothed aspen, may be distinguished by the round or ovate leaves, which have finely saw-toothed margins and short points. The aspen is more conspicuous in summer, when the constant trembling motion of its leaves attracts the attention, than it is in winter, although in some individual trees the smooth, green bark of the trunk is very attractive in contrast with the snow. The large-toothed aspen may be distinguished by its coarsely wavy-toothed leaves, which are larger than those of the American aspen, which it resembles. (See illustration.) Both species are very common throughout New York State, especially on abandoned fields, on land from which the trees have been cut, and on burned areas. The aspen reproduces very easily from seed, and often it is the first tree to spring up after a woodlot has been cut over. It grows rapidly and is short lived, but is of value because it covers the soil rapidly and acts as a temporary shelter for more valuable trees while they are young. The wood is from light brown to white in color and is neither strong nor durable. It is the first wood that was used in making paper pulp. It is used, also, for buckets, pails, kegs, wooden dishes, and boxes.

Arbor vitæ

BUTTERNUT

The butternut, sometimes known as white walnut, is in size usually small to medium reaching a height of from thirty to fifty feet and a diameter of from one to two feet. Many, however, reach a height of one hundred

Above, large-toothed aspen; below, trembling aspen

Sycamore, leaf and fruit

Sassafras leaves, showing variations

Butternut, leaf and fruit

feet and a diameter of four feet. It may easily be distinguished from the black walnut by the trunk, which is shorter and has light-colored bark, dark brown chambered pith, and larger and more flattened terminal buds. Among all the native trees, the butternut is probably the most interesting for winter study. The naked buds, the irregular leaf scars with horseshoe bundle scars, and the brown chambered pith make the tree easily distinguishable at any season of the year. The butternut is widely distributed in the eastern United States, and is found locally throughout New York State in rich bottom lands and on fertile hillsides. It is not classified as a valuable timber tree, but it has been used rather extensively for ornamental purposes.


Bark of the butternut

The wood of the butternut is light brown in color. It is easily worked since it is light and soft, and is much used for furniture, gunstocks, interior finishing, and flooring. The inner bark is used for medicinal purposes, and a dye is made from the bark and the nutshells. It is a short-lived tree and will not grow under shade. It is found, therefore, along the border of woods, fences, and in open fields.

CATALPA

The catalpa belongs to a family that comprises about one hundred genera and fifteen hundred species. Most of the representatives of this family are found in the tropics, only a few being found in the temperate zones. The eastern catalpa, which is often called Indian bean and cigar tree, can be distinguished in summer by its leaves, which are opposite or whorled, and by its very large white flowers. The cigar, or beanlike fruit, is a characteristic in autumn and winter.

This tree has been planted for ornamental purposes in many parts of the State and has been widely advertised as a tree suitable for making fence posts and railroad ties. It is not suitable, however, for these purposes in New York State because of the too severe climatic conditions.

SASSAFRAS

Few trees are more interesting than the sassafras. In summer it may be identified easily by the leaves, which have different shapes and present quite a variation. (See illustration.) The sassafras is of little com-

mercial importance in the State on account of its limited distribution and its small size. The seeds furnish a valuable food for birds, while the wood, the bark, and the roots, yield an aromatic oil extensively used to flavor medicine and candy and to perfume soaps. The wood is also used for posts, rails, furniture, interior finishing, and making barrels and casks. The sassafras tree grows rapidly and thrives on a rich sandy loam. In autumn when the leaves turn yellow and red, it is a picturesque tree.

Branch of witch-hazel in blossom

SHADBUSH

The shadbush is a small tree from ten to twenty-five feet in height, with a diameter of from two to twelve inches, and is often found in open situations and in moist soils. It is often called service berry and June berry. In the early spring the shadbush is very attractive because of the beautiful white flowers that appear before the leaves, and it is very common in the understory of hardwood forests. The wood is heavy and hard, and checks and warps easily. The close-grained wood takes polish readily, and for this reason it is used mainly for turned articles. Because of its small size and little value commercially, the shadbush is used chiefly for ornamental purposes.

SYCAMORE

The sycamore, or buttonwood, can readily be distinguished in summer by its massive form and by the whitish, yellowish, or greenish bark of the upper branches, which at times are covered with large, thin, dark brown scales of outer bark. The shedding of the bark makes the tree easy to identify, since the process is more noticeable than in any other species. The sycamore may also be distinguished by the fruit, which is borne singly in brown heads about one inch in diameter, suspended from a slender stalk. The fruit matures in October but often persists far into

the winter. The growth of the sycamore is very rapid, and a tree may live to be six hundred years old. The sycamore is distributed from Maine and Ontario south to Florida, west to Minnesota, Nebraska, and Texas. In New York State it is found along the streams and prefers moist, fertile soils. The wood is used for interior finishing and in the manufacture of furniture, crates, tobacco boxes, and charcoal.

WITCH-HAZEL

The witch-hazel is a small tree or shrub sometimes reaching a height of twenty-five feet, but usually smaller, with a short trunk, bearing numerous spreading, crooked branches, which form a broad open head. It is a tree of very wide distribution, and in all probability may be found in every county in New York State. In the fall it may easily be distinguished since it blossoms at this time, when most of the trees have shed their leaves and are preparing for winter. The witch-hazel is of no commercial importance, although the bark is used for medicinal purposes. The fruit ripens in October and November at the same time that the blossoms appear.

TWO FRUIT TREES FOR STUDY IN 1915-1916

H. B. KNAPP

THE PEACH

The apple has been called the king of fruits, and justly so because of its popularity and widespread use. If the apple deserves this title, then the peach is just as surely the queen of fruits, possessing the qualities of beauty, tenderness, and luscious flavor to a degree that no other of the northern fruits can boast. It is an old, old fruit, originating either in Persia or, more probably, farther eastward. The species name Persica, to which this fruit belongs, is derived from Persia, where it was long thought that the peach was first grown. There are several groups of peaches now grown in this country, just as there are several groups of cherries. These groups differ in the size, the shape, and the flavor of the fruit and in the manner of growth of the tree. Only two of these groups are of commercial importance in New York State: the North China group, to which the Elberta belongs, and the Persian group, of which the Crawford is an example.

The peach is the tenderest of all the commercial fruits. It can be grown with the greatest success only in the more favored sections of the State, namely, those regions in which the climate is tempered by nearness to large bodies of water. For example, the Ontario Lake region of New York State is recognized as one of the foremost peach-growing sections

in this country. This does not mean that the peach may not be grown in less favored sections of the State, but it does mean that it will require more attention in those parts because it is not naturally adapted to them. On the whole, to grow this fruit successfully requires more care and skill than to grow any other of the orchard fruits. It is very susceptible to cold, to fungous diseases, and to the attacks of insects. It is wholly intolerant of sod or grass, and, unlike the cherry, it is a decided failure when planted in an out-of-the-way corner of the garden and left to shift for itself. The peach will thrive in proportion to the care bestowed on it; while some fruits will thrive in spite of lack of management by the grower, this is not true of the peach.

The peach is grown on a variety of soils, and the types on which it succeeds best are more definitely known than in the case of any other fruit. A soil that is light and warm, such as a sandy or gravelly loam, gives best results. The peach does not relish a wet soil, and those just mentioned are, of course, well drained by nature. The peach is sometimes grown on heavy soils, but the fruit is less likely to mature at the proper season. In addition, the tree often makes wood growth at the expense of its fruit-bearing habit, and frequently the buds are not mature when cold weather sets in.

The best time to plant the peach is in the spring. If planted in the fall it is very likely to succumb to the cold of winter. The land, which should have grown a cultivated crop the previous year, should be plowed and put into condition for planting just as early in spring as possible; for the earlier the tree is set, the better is its opportunity to become established before dry weather arrives. The trees are commonly set twenty feet apart, although at the present time many fruit growers are planting them twenty-two feet apart. The peach tree is always set when one year old. At this age it will be from four to six feet tall, with a number of side branches. These branches are usually pruned off when the tree is set, and the top is cut back to three feet or less in height. The peach is headed much lower than are other tree fruits; and the closer to the ground the head is desired, the shorter should be the whip left when pruning. The top is usually cut back and thinned out rather severely each year, as the productivity of the tree depends on the stimulation of new growth.

All fruit trees thrive best if given good cultivation, but none is such an absolute failure when left in sod as is the peach. In this condition the vitality of the tree is so weakened that it becomes an easy prey to insect enemies and fungous diseases. The life of the peach tree is short at best, being about twelve years, but if grown in sod it will not last more than five or six years.

The ground about the trees should be plowed in early spring and cultivated every week or ten days until late July or early August. At this time a cover crop should be sown, to remain on the ground during the ensuing winter and to be plowed under in the spring. This cover crop may be rye, vetch, or some of the clovers. The cover crop affords one of the most inexpensive means that there is of furnishing fertilizer to the trees, and in some cases it may furnish all the plant-food necessary if the land is rich naturally. Oftentimes, however, commercial fertilizers are needed in addition, chiefly phosphoric acid and potash. The amounts to be applied can be determined only by actual experiment.

The peach tree begins to bear fruit when three years old, the average yield at that time being about one-third of a bushel. With good care the yield will usually increase until the tree is ten years old. At this time the production of each tree will be in the neighborhood of three bushels. These figures will, of course, vary with the varieties and the conditions under which the fruit is grown. The fruit-bearing habits of the peach differ from those of other tree fruits in that all the fruit is borne on wood of the previous season's growth. This is sometimes called one-year wood. The upper and lower parts of the previous season's growth usually contain single buds. These are leaf buds. In the central part of the branch, however, the buds are generally in clusters of three. The central buds of these clusters are always leaf buds, while the outer ones are fruit buds, each containing a single blossom. It is often the case that only a small proportion of these buds develop sufficiently to bear fruit. It is well that this is so, because if all the fruit buds that form each year were to produce fruit the trees would be overloaded and considerable time and money would have to be expended in thinning the fruit. Even as it is, the growers of fancy peaches practice thinning the fruit each year.

It will probably be necessary to spray the peach. Insects and diseases will vary with the different sections and with the conditions under which the fruit is grown. For information on these subjects, a publication devoted to their treatment should be consulted.

It is not possible to recommend varieties for planting with any assurance that they are the best varieties for the purpose, without first knowing the conditions under which they will be grown. Persons are likely to feel that those fruits that are grown at a considerable distance and are unknown in their own community, are superior to those found at home; but the safer way is to plant those varieties that have proved suitable for local conditions.

The peach is one of the finest fruits and should be found in every home garden where the tree will grow. It will not thrive without care, but it will repay the caretaker for the time spent on it.

THE CHERRY

The cultivated cherry is not a native of this country; it came from southeastern Europe, where many fruits originated. There are many species of the cherry growing wild in the United States. A few of these give promise of being useful and valuable some day, but as yet they do not compare with those from the Old World.

This fruit is steadily growing in importance. There are already a large number of cherry orchards in western New York and in other sections of the United States. The fruit is used chiefly for canning, and is very delicious for this purpose.

Cherries may be divided into two groups — the sweet and the sour. The trees differ greatly in appearance and in habits of growth. The sweet cherries are large, vigorous, upright-growing trees with reddish brown bark, which separates in rings. The flowers appear at the same time as the leaves. The sour cherries are low-growing trees with spreading, bushy heads, much resembling in size and shape the head of the peach tree. The flowers appear before the leaves. It is the sour cherry that is chiefly grown on a commercial scale, although the sweet cherry is gaining in favor for this purpose.

Both sweet and sour cherries are divided into groups, and these groups in turn are made up of different varieties. There are four distinct groups of sweet cherries: the *Mazzards*, which grow wild in eastern United States, not desirable in themselves but furnishing good stocks for other groups; the *Hearts*, large soft, heart-shaped cherries, either light or dark in color, represented by Tartarian and Wood; the *Bigarreaus*, also heart-shaped, but very firm and meaty, Napoleon being a common variety; and finally, the *Dukes*, light-colored, not so sweet as the other groups, and represented by May Duke. These classes have been mixed by crossing, until now it is very difficult in many cases to tell in which group a variety belongs.

The sour cherries are separated into the *Amarelles* and the *Morellos*. The Amarelles are light red cherries with uncolored juice, Richmond and Montmorency being well-known varieties. The Morellos are dark red, more acid than the Amarelles, and have a colored juice. The Morello, grown for so many years, belongs to this last-named group.

The cherry is propagated by budding, in the same way as are the apple and the pear. The stocks used are the Mazzard, which has been mentioned, and the Mahaleb, a European species. Of the two stocks the Mazzard is the better, because it makes a larger, more vigorous tree. The nurseryman prefers to use the Mahaleb, however, as it effects a union with the scion more readily and does better in the nursery row. Cherry trees are usually set out at two years from the bud, although one-year-old trees may be used. Sour cherries are set from sixteen to eighteen feet

apart, and the larger-growing sweet cherries are planted from twenty-five to thirty feet apart.

The tree does not require much pruning. Most of the fruit is borne on spurs on two- or three-years wood, although spurs are found on much older wood. Some fruit is often found at the base of the one-year wood, and these cherries are usually the largest and best. These do not grow on spurs, but come from a single bud; consequently, as soon as the fruit is borne, no further growth takes place. This accounts for the long, bare spaces often found at the base of the one-year wood. In general, a large amount of wood growth in a single year should not be encouraged, and, since heavy pruning induces wood growth, young cherry trees should be pruned but lightly. From three to five branches are used to form the head. In the sweet cherry the central-growing shoot, or leader, is removed, in order to keep the head as close to the ground as possible. The head of the sour cherry is thinned out and cut back but little.

Cherries thrive in a warm, well-drained soil that is not too heavy. A gravel is suitable for most varieties, although the sour cherries do better on the heavier soils than do the sweet cherries. Clean shallow culture should always be practiced. A cover crop should be sown in midsummer, to remain on the ground until the following spring.

Cherries are picked a few days before they are fully ripe. They should always be picked with the stems on unless they are to be canned at once. They should be gathered by the stems instead of by the fruit.

The cherry tree will thrive with as little care as any of the fruit trees, and responds as readily to skillful treatment. It should be planted on every farm and in every garden.

Rural school children planting a tree

THE RURAL SCHOOL AND THE COMMUNITY

The program needed to unite rural school and farm community is then, first, to enrich the course of study by adding nature-study and agriculture, and about these coordinating the conventional school subjects; second, to encourage the cooperation of the pupils, especially for the improvement of the school and its surroundings; third, to bring together for discussion and acquaintance the teachers and the patrons of the school; fourth, so far as possible to make the schoolhouse a meeting-place for the community, for young people as well as for older people, where music, art, social culture, literature, study of farming and, in fact, anything that has to do with rural education, may be fostered; and fifth, to expect the teacher to have a knowledge of the industrial and general social conditions of agriculture, especially those of the community in which her lot is cast.

Chapters in Rural Progress
Kenyon L. Butterfield

PART II

A MESSAGE TO TEACHERS

BEVERLY T. GALLOWAY

THE Cornell Rural School Leaflet is intended as a help toward keeping the outdoor viewpoint before both teachers and pupils, who living and working in an agricultural community should give reasonable consideration to the possibilities of an agricultural application of their knowledge. Knowledge unused is as worthless as buried money; and to confine our knowledge to that which is not applicable to the living conditions in our own locality, is like acquiring money of a foreign coinage. It is therefore wise, since we believe in rural life and in its benefits, to acquire the sort of learning that can be used in our intimate everyday affairs. Then, too, since rural life is an outdoor life, a great deal of work should be done out of doors. The pupils should gather their own materials and should work with these materials. They should be given opportunities to apply their knowledge to problems in and around the school, as in the improvement of the school grounds by planting trees and shrubs or in the development and care of lawns; they should be given opportunities for school and home garden work.

Each year finds further development of agricultural teaching not only in the higher institutions of learning, such as the colleges and the universities, but in agricultural high schools, and even in the rural grades. If such work has not been undertaken in any school, simple beginnings can be made, and in the course of time will lead to great advancement. There is no need of forcing matters or of trying to seek more than a gradual development. As far as possible this development should be natural and spontaneous, and should depend rather on the child's natural desire to learn than on the teacher's inclination to impart knowledge. Moreover, this is the best way to secure an interest on the part of the pupil in all subjects taught in the school.

Over the portal of the children's room in the Smithsonian Institution at Washington, these words are blazoned in gold: "Knowledge begins in wonder." As soon as children begin to wonder about the whys and wherefores of the things they see around them, then are their minds in condition for receiving the impressions that will be of most use to them in after years. The wonders of nature are not inside the covers of books; they are in the air we breathe and spring from the ground we tread. Books

are a necessary and a convenient part of the educational equipment, but if one learns from books alone, his grip on the vital facts of life is not likely to be a sure one.

TO TEACHERS IN COUNTRY SCHOOLS

GEORGE A. WORKS

Do not start the year with the impression that because you are in a district school you can make no contribution to school progress. What this year is to mean to the boys and girls of this State depends more on you than on any other group of persons. Neither trustees nor district superintendents are in position to exert so great an influence on the school life of the children as you are. To-day much is being said and written about the improvement of the school in rural communities, but eventually it all comes back to you. You are face to face with its problems every day. What we most need to-day are not men and women in universities, colleges, and normal schools, telling what should be done to redirect the rural schools, but teachers in these schools demonstrating what really can be done to secure effective teaching of country life subjects. You have some opportunity, no one can tell you what it is, to render your pupils and progress a service. Find it, live up to it, and later help your fellow teachers to grow as you have grown. This does not mean that daily you are to go to your work weighed down with a load of responsibility, but rather that you are to go with enthusiasm and spirit because of the opportunity that is at hand.

The rural school presents many opportunities

A CHAT WITH RURAL TEACHERS

ALICE G. McCLOSKEY

IT IS September, and the school year has begun. Here and there along the countryside farmhouse doors will open, and boys and girls will come out and start hopefully along the open road to the schoolhouse. The teacher will be ready to meet them — the one who is to inspire and guide these young minds toward useful and happy living. A little child is always a sacred charge, and there is no greater opportunity than to direct a young mind toward wholesome growth and a realization of the abundance of life.

As these young children leave their homes on the first day of school, there cannot but be anxiety for their future. The sturdy little lad scuffling along among the falling leaves cannot know, without teaching, the things that will give him a richer manhood and the opportunity to do a more definite work in the days of his greatest usefulness. He cannot know, unless some one teaches him, that health must be his portion if his life is to be joyous, and if his work is to be well done; that he must have clean teeth; that he must be controlled in his social relations; that he must strive daily to have charity and tolerance; that he must form habits of kindly judgment; that he must daily make a contribution to the welfare of the home; that he must avoid boorish manners. The little lad cannot know, unless some one teaches him, that a great part of his education must come from reading good books, and that his life will be enriched by intimate association with the out-of-doors.

There is also the chubby little maid coming out of the farmhouse door, which, perhaps, she closes with difficulty; then trudges along among the falling leaves. She does not know, unless some one teaches her, that she, too, must have this preparation for life that her brother has; that she must be clean, and wholesome, and healthy; and that education must give to her the great resources of literature and the out-of-doors, which will make a glorious background for any life, however difficult. She cannot know, unless some one teaches her, the importance of refined and gentle manners; this does not mean that she may not enter into any gladsome sport and pastime that her brothers enjoy. She must learn that out-of-door exercise, such as skating and skiing, helps to make for vigorous happy woman hood. She, too, must learn to have charity and tolerance for all. And fully as important as any other lessons, this little maid must learn the dignity and the importance of household work well done.

Now, who will teach these little children? Some of the lessons of life will be learned in the homes. There are parents throughout the country who realize the importance of good food, of fresh air in sleeping rooms, of daily care of the teeth, of cheerful fireplaces, of happy and useful home life, of the growth in out-of-door sports, and of association with good books, and the value, particularly to the farm child, of a knowledge of nature. Many children, however, who will enter the schoolhouse door some day this month of September, will have had but little right teaching; therefore, opportunity will come to the school-teacher who will help by her life work to leave behind those who, because of her inspiration and help, will doubtless go further than she. Toward this end the teachers this year, each and every one, are asked to consider some of the following suggestions that may help to make a stronger and more useful manhood and womanhood in the country districts of New York State.

A meeting of the parents.—At a meeting of the parents the teacher should present as fully as possible the plans for the year's work. If the parents in the district have not previously cooperated with the teacher, it might be well to mention only a few of the results desired, because many communities at the present day need to be educated along new ideas and ideals for the development of the rural school. Too many requests at one time might defeat the work.

The improvement of the school building and grounds.—Much has been done to improve the physical surroundings of the school, in many rural districts. In some of them, however, nothing of this kind has as yet been accomplished. This year a beginning will doubtless be made in almost all, because the success of the teacher is now measured not alone by the textbook work of the school, but by the progress of the school as an educational district. If the community is not willing to give any money for improving the school, the teacher and the boys and girls can make a beginning by having an ideal of neatness and cleanliness. When the people in a community see something accomplished in this respect, they will be more ready to help the enterprise financially. It does not take much money to make things clean, to have neat curtains or shades at the windows, and the like. Some trustees recognizing the earnest endeavor of teacher and pupils have planed, sandpapered, and varnished the desks; still others have helped in redecorating the interior of the building as well as in improving the general outside conditions. The children will be glad to help in cleaning up the grounds, and in taking part in some simple planting.

Physical background.—The health of boys and girls of school age should receive constant attention. If children are breathing through their mouths instead of through their noses, the cause should be investigated. Fresh air in the sleeping room should be discussed. Care of the teeth is most

important. Many persons have been handicapped through life because their teeth were not taken care of in childhood. A salt solution has been recommended by a good dentist as a very valuable mouth wash in country districts where children do not have some of the preparations now of value in keeping the teeth in good condition.

Habits.—Teachers often have better opportunity to observe the habits of boys and girls than do their parents. The entire future life depends largely on the habits formed in childhood; and because of this, those who are constantly with children, must take some responsibility so that each day the good habits strengthen and the weak habits gradually decrease.

It is important for children to form the following habits: (1) Habits that lead to good health: cleanliness; ventilating living and sleeping rooms; cleaning the teeth; caring for the eyes; taking exercise; standing erect; and the like. (2) Habits that are of value in personal association with others: thoughtfulness of parents and older persons; courtesy; a quiet voice; good manners; an aversion to gossip; avoidance of petty or unjust judgments; punctuality. (3) Habits that strengthen honesty: playing the game straight. (4) The habit of finishing a piece of work in detail. (5) The habit of committing good literature to memory. (6) Habits of close observation. It is important for children to appreciate that a person of culture is always able to see the other person's point of view.

Good manners.—The teacher might express at one of the meetings of parents her willingness to aid in teaching the children good manners. Many parents will appreciate such help, realizing as they do the importance of social fitness. Loud voices, boorish ways, lack of consideration of older persons, and rough, boisterous habits of intercourse, will often defeat young persons in many opportunities for growth and for pleasure that might otherwise be theirs. Children should be taught the reasons why definite social forms are observed. If this work is done with earnestness and with sufficient frequency, the children will soon realize its importance.

Nature study and agriculture.—If the plans of the teacher include instruction in nature study and agriculture, parents should understand the place that these subjects now have in the educational world. Many parents will say that they know more of agriculture than does the school-teacher. This is doubtless true, but all lines of endeavor are dignified when made a part of the educational system; and when boys and girls work out with the teacher some problem in farm practice, the lesson may be connected with other school subjects, such as geography, language, arithmetic, and the like. Some parents object to nature study because they have not fully realized that all boys and girls on the farm need for their best success a natural-history background. Many farmers possess this without knowing how it was obtained. Since natural-history subjects have educational value, they may well be presented with other school work.

In the teaching of nature study and elementary agriculture, it may be helpful to have in mind the following:

During the first six grades in school, out-of-door study should develop the spirit of the naturalist — a general interest in the out-of-doors. If properly taught, at the end of this period the child interested in natural forces and objects will have acquired a spirit of patient inquiry and accuracy in observation. He will begin to realize the kinship of out-of-door objects and the possibilities of interest and resource in them.

Teachers in country schools will find, however, that many boys and girls are not interested in nature study from the viewpoint of the naturalist. The pupils should not be forced into this interest, but should be allowed to turn their minds to the more practical side of the subject. There are very young children much interested in the commercial side of poultry raising, growing potatoes, and the like. These boys and girls should be encouraged so that they will get the point of view of the naturalist. A field of timothy is as beautiful as a field of violets. Who has not felt his spirit quicken at the sight of a field of oats in the sunlight or in the early evening? Who has failed to see the beauty of pumpkins in the cornfield in the "blue October weather"? What form of animal life is more attractive than young chicks or ducklings?

The work for the seventh and the eighth grades, as outlined in the elementary syllabus, has relation to agriculture and may be intensified according to the amount of time given to it and the interest of teachers and pupils. Each lesson should lay the foundation for agricultural knowledge, which will be introductory to high school and college work in these subjects. Teachers of the seventh and the eighth grades are advised to follow the work outlined by the syllabus for these grades, choosing for the most serious study, however, the subject that is of greatest interest in the community — as fruit growing, raising of farm crops, dairying, or the like.

Fruit growing.—If fruit growing is the special interest in the community, the marketing of apples or other fruit should be discussed in autumn. An exhibit of fruit collected from the neighborhood by the children and identified and labeled as to species and varieties has a distinct educational value. If there is one particularly popular variety of fruit in the community, the pupils should be sent on a quest for the reason. A successful fruit grower might be asked to tell the school of his methods. Sometime during the school year the pupils should plant a fruit tree on the school grounds if there is a suitable place. The children should be made to realize, even in the most elementary way, the interrelation and the interdependence of outdoor things. For example, the study of soils will be most interesting and will have added value if made in the interest of a tree to be planted. The advantage of having a home fruit garden should be discussed.

Dairying.—If dairying is the chief industry in the community, the subject matter as outlined in the syllabus for which specific material can be found, should be used.

In country places a visit should be made to a farm in order that the children may learn the types of cows and begin to think about pure breeds of cattle. A Babcock test machine might be placed in the schoolroom, and milk from different farms tested by the pupils. When the test has been successfully made in the schoolroom it would be valuable to have the class make this test at a grange meeting or a farmers' institute. The matter of balanced rations may be studied, also other subjects of interest on a dairy farm (pages 1200 to 1233).

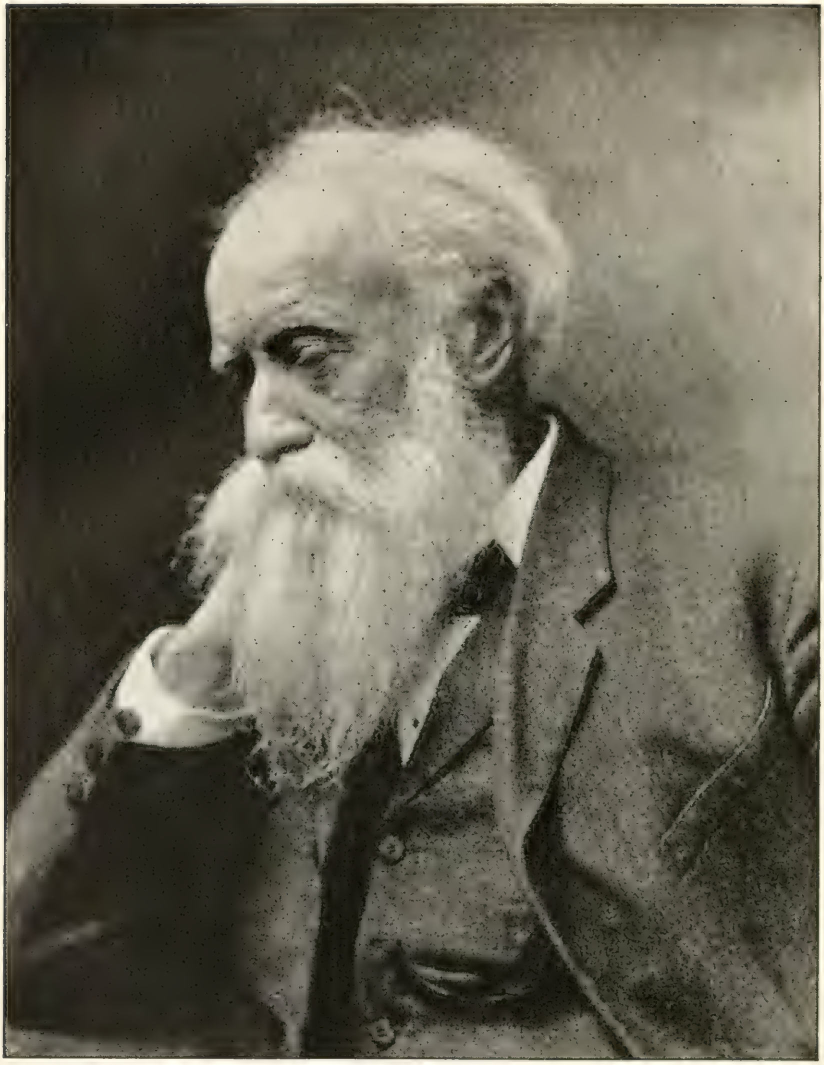
Nature study corner.—In order to encourage the children in their general out-of-door observations, many teachers have found it helpful to have in the schoolroom a nature study corner. There should be a table on which specimens may be kept, and above this a shelf containing reference books. The children may be taught to bring to the schoolroom specimens of plants to be left on this table until the teacher has time to identify them. If the teacher is unable to identify any plant, it should be sent to the College for identification. A good-sized specimen should be sent, showing roots, leaves, and flowers or fruit, if possible.

Terrarium.—A terrarium, which is an enclosed piece of earth on which things may live and grow, has been found very interesting in some of the schoolrooms in New York State. Many kinds of animal life have been housed in terraria. The writer has seen salamanders, toads, snakes, butterflies, caterpillars, beetles, rabbits, hens, guinea pigs, and kittens, in terraria in different schools. Children have been allowed to watch the animal life during leisure hours.

Aquaria.—Aquaria have not been very successful in most schools, but any teacher can use to advantage battery jars, or even mason fruit-cans, in which aquatic forms of life may be kept for a limited time.

Gardening.—There should be opportunity for gardening if only on a small scale. The gardening connected with the rural school might well have relation to the planting of the grounds with some of the native vines and shrubs that can be found along the waysides and in the woods. There should be some experimental work that will have relation to farm interests. Corn, potatoes, a plat of alfalfa, or the like, will lead to observation of the home crops.

For the cultivation of a large piece of ground for children's gardens it is well to buy the seeds in bulk. Some of the older children will enjoy putting them in packets and marking them. The teacher, with some of the children, might estimate the number of lineal feet to be planted with each kind of seed. If the teacher does not know the quantity needed for this estimate, the seedsman will tell her.



John Burroughs
Naturalist and farmer

Away with clocks and sundials! Time and I
  Have made a compact — this to be my boon —
To hear the evening thrush, and know the hour,
      Yet feel it noon.

JEAN DWIGHT FRANKLIN[7]

[7]Courtesy of the *Atlantic Monthly.*

John James Audubon

Every boy and girl should have a vegetable garden at home. Later in the year the editors hope to send a special leaflet on gardening to all rural schools, in which this work will be discussed.

Books.—One of the greatest needs in the country school to-day is that boys and girls should have an opportunity to become intelligent readers. Interest in good books will open up the world in far-reaching ways and will give a resource for the future that all boys and girls in the country should have. The rural school library need not be large, but it should be well chosen according to the age of the pupils, and should contain a few works of history, travel, poetry, and fiction, and a few good reference books in nature study and agriculture, for boys and girls living in the country should have intelligent knowledge of country surroundings. (See page 1433.) The value of reading aloud to the boys and girls cannot be overestimated. If the teacher will begin by reading fairy tales and stories that have an absorbing interest, she will gradually be able to read aloud some of the other kinds of literature that will be of lasting importance in the lives of the young persons. Some teachers have read passages from the works of John Burroughs, farmer and naturalist, and have afterward lent to the children the books from which they read, thus giving to the pupils a new interest in good literature and a desire to imitate one whose life is spent in joyful appreciation of the out-of-doors. A brief talk on the work of John James Audubon and the reading aloud of some sketch of his life, will increase the interest in the study of birds and will also awaken an appreciation of one who sacrificed much to do his work fundamentally and well. It will be well to have the pupils commit to memory at least one good poem during the year. Memorizing verse often develops appreciation of it, and poetry should be a part of the education of every individual.

Exhibitions.—A most valuable way of arousing the interest of young persons in any new work is to have exhibitions. There is educational value in such endeavor, as the children nearly always make their very best effort in preparing the individual exhibits, and they have opportunity to compare their work with that of other pupils. The small school exhibits are doubtless as valuable as any, and the children should be encouraged to prepare for them. An exhibit of fruit or corn or of the eggs and feathers of poultry, or a general nature study exhibit, will bring about a broader interest than will many formal lessons in agriculture. Often schools prepare exhibits for the county fair, and some for the State fair. Many send exhibits to the State College for Farmers' Week. This year it is hoped that each rural school in New York State will send at least one nature study exhibit and two ears of corn. (See pages 1378 to 1398.) These should be sent to Ithaca by January 31, addressed to Edward M. Tuttle, College of Agriculture, Ithaca, New York.

Field trips.—There should be at least one field trip each year, in which the children have an opportunity to share out-of-door experiences with the teacher. No matter how little knowledge of nature any of the group may have, the trip will be worth the while. In the springtime many specimens of plant life can be collected for future discussion at school. In winter a short trip into the snow-covered fields or woodland will give joys that will never be forgotten. And autumn is, perhaps, best of all, with the spirit of harvest over the land, the golden pumpkins in the field, the falling of the leaves, and the stores of nuts that delight both the red squirrels and the boys and girls. It should be remembered that a field trip has a purpose, that it is a part of the school activity. Teachers should expect the children to pay attention, and to listen to what is discussed. Each one should have something to contribute before the end of the trip, and all the others should profit by it.

Agricultural clubs, contests, competitions.—In this leaflet is a statement from Mr. Layton S. Hawkins of the University of the State of New York, on the organization of country life work in the rural schools. The staff of the New York State College of Agriculture is in sympathy with the ideas presented by Mr. Hawkins, and will give hearty cooperation in an effort to standardize them. Education in agriculture and in home making must become a part of the school life to be fully worth the effort. Whenever the results of home project work, directed by the school organization, are worthy of wholesome competitions at school fairs, county fairs, teachers' associations, state college exhibitions, and the like, additional interest will be added. The club plan often does more harm than good, and it does not stand for permanence. Hastily organized contests, without constant local supervision, cannot be educational. Agriculture, home making, and the study of nature, are dignified and valuable means to education, and the sooner instruction in these subjects becomes a part of the school day, the sooner they will become a definite part of the preparation for life of all boys and girls in rural districts.

CORN DAY

(Friday, December 3, 1915)

EDWARD M. TUTTLE

LAST year showed that the spirit of Corn Day is growing in the schools of New York State. Coming as it does on the first Friday in December of each year, it affords an opportunity for the celebration of the harvest, and while the interest centers primarily on the corn crop, the scope of the occasion is often broadened to include many other things. In any year it is desirable to take advantage of the opportunity offered during September, October, and November, to make a study of the corn crop in the local district, but it is particularly important in 1915 because corn is outlined by the State syllabus for special study. Between the time that school opens and Corn Day, the teacher should encourage and guide the pupils in making a study of the local corn crop, and the information so obtained may be condensed and presented to the visitors at Corn Day. There are many points on which it would be interesting to obtain local facts. Among them are: the acreages devoted to corn on the different farms; the total acreage for the district; the yield per acre, highest, lowest, and average; the place that corn occupies in crop rotation; how the land is fitted for corn; what varieties are grown most extensively; how the corn is cultivated; what use is made of the crop — whether most of it is cut for the silo, or whether most of it is allowed to mature and is then cut and husked; where the farmers obtain their seed corn; if they select it themselves, what method they use; how the corn is stored over winter; how many farmers test their seed corn. Questions such as these, answered by the pupils on Corn Day from information that they have gained by actual study during the fall, will be highly interesting and exceedingly instructive.

It has been said sometimes that when Corn Day is held annually, the interest flags after the first year or two. This may be true in some districts, and where there is no special interest to make a worth while celebration, Corn Day should be omitted and something else substituted. Even in such schools, however, a Corn Day celebration should be held at least once in three or four years in order that the children may have an opportunity to study this important crop and to present to their elders the work that they have done. There are many schools that find it desirable to celebrate Corn Day annually, and that obtain excellent results. There is an unbounded wealth of information that can be learned about corn. It can be approached from many different angles, and wide-awake

teachers will center the interest one year around some particular phase, and another year around a different phase.

In connection with the study of the corn plant during the fall and in preparation for Farmers' Week, teachers will find the material on pages 1289 to 1309 full of suggestions. The article on corn judging on page 1301 will be particularly useful in teaching the boys and girls to recognize quality in seed corn, and in proportion as they gain ability in this regard, the exhibit at the school on Corn Day will improve.

It is impossible, even were it desirable, to attempt to outline any fixed mode of procedure for the celebration of Corn Day. As it becomes a more

General view of the rural school corn show at the New York State College of Agriculture during Farmers' Week, February, 1915

established custom in the schools, various modifications and local adaptations present themselves. From a large number of reports of Corn Day experiences, several that may be of interest have been selected.

Hunt, New York, January 27, 1915

Dear Mr. Tuttle:

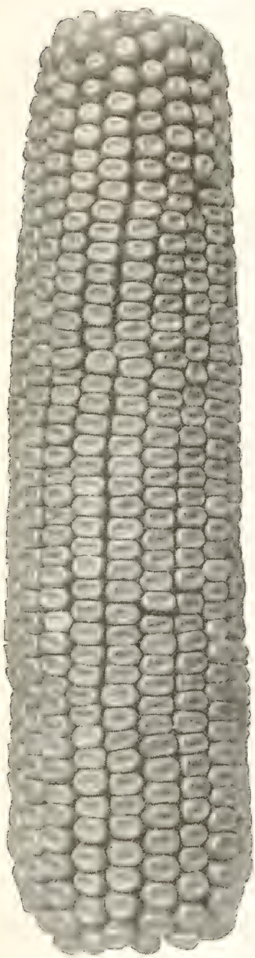
By the same mail I am sending you an ear of corn. It is not what we have learned constitutes a perfect ear of corn, but to encourage agricultural interests with the pupils and the inhabitants we observed the day, and I am very much pleased to say it was a success and created much interest in the entire community. Many remarked that they would certainly try their best to make it more possible to have better corn from which to select an ear another year.

I am also sending a few printed words about our Corn Day.

Yours sincerely,

MARION CHASE

The extract from the local paper, sent by Miss Chase, reads as follows:



State prize dent corn. Farmers' Week, 1915. Sent by District 11, Town of Seneca, Ontario County

Corn Day was observed by the school at Big Bend December 4, with the following program: An essay, "The Past and the Present History of Corn," by Sheldon Raquet, proved very interesting as it not only gave the early history of corn, and what it meant to the Indians and the early white settlers, but some important facts of what it means to our country at the present time. "Cultural Directions," as given by Ivan Newville, gave even the experienced farmers many profitable hints which were highly commented on. Other numbers on the program also deserve much credit, especially the talks and the readings given by those in attendance. The schoolroom was appropriately decorated with corn products. Mr. Walker acted as corn judge. The exercises were well attended, which is greatly appreciated by the school, especially the attendance of the farmers, which tends to show the interest they take in the agricultural work of the school.

Union Springs, New York, December 16, 1914

My dear Mr. Tuttle:

As several of my children tell me that they have written you about our successful Corn Day, I presume there is little you do not know about it.

Yes, it was a success in every way. But I know of nothing which was more gratifying to me than to stand aside and watch the men, mostly farmers, coming in. Frequently one was heard to say "I've never been in this building before," or, "I haven't been here since I was a boy in school," and when they were going home, "I had no idea what Corn Day was like," "I'm coming again next year," and the like.

And such a crowd! Of course we started advertising weeks before. Each week the local paper published a notice for us; the drawing classes made posters; the English classes wrote invitations; postal cards were sent to all the near-by farmers; Mr. Yawger announced it at the grange, and, best of all, the little people talked corn. One mother told me that her family had had corn three times a day. Having the program at night, parents necessarily came with the children. The main room was filled, and as many as possible were seated in the north room.

Mr. Teal, manager of the farm bureau, talked on "What Constitutes a Good Ear of Corn," and Dr. Barrus of Cornell interested the children very much with his illustrations and lesson on corn smut.

Many helpful suggestions were made to me that evening, and I feel confident that next year our exhibit will be even better. The braid of King Philip corn, which was lent to us, was really quite an exhibit in itself. Many of the farmers offered to make braids for me next year.

My one regret is that we didn't have a flash light taken so that you might see how it all looked.

Just now is a busy time, but I shall try to send you our corn in a few days.

Sincerely,

VERA E. COTTER

District 10, Town of Hector, Schuyler County

Lodi, New York, February 2, 1915

Dear Mr. Tuttle:

Please find enclosed the program for our Corn Day. We had a splendid time, and there was a nice display of corn. We have sent to the Farmers' Week the best ear that we have.

The pupils and teacher from another school spent the afternoon with us After the program we played games till time to go home.

Trusting that our ear of corn will win a prize, I remain.

Yours truly,

LENA GRANT

The program sent by Lena Grant, is as follows:

PROGRAM FOR CORN DAY

Pupils

A $1000 ear of corn. . . . . Lena Grant
The largest yield of corn. . . . . Chester Houseworth
Corn products. . . . . John Covert
Seed corn. . . . . Herbert Robinson

Patrons

Corn judging. . . . . Walter Gordnier
Types of corn suitable for Schuyler County. . . . . Wilbur Horton
Dairy corn. . . . . Elvin Horton
Growing corn in Missouri. A. B. Stevens
Corn in other States. . . . . Mr. Wiemes
The yellow flint. . . . . Marion Pierson
Corn recipes. . . . . The Ladies of the District
Corn Fun. . . . . George Robinson
Corn Cob Social, for. . . . . Old Codgers

It is usually customary to have some local farmer judge the exhibit of corn that the children have selected for Corn Day, making a final decision

as to the best ear of the flint type, and the best ear of the dent type. These two ears, or one ear if both types are not available, may be sent to the College of Agriculture to represent the school in the general corn show during Farmers' Week, held each year in February. It is worth while for several reasons for a school to make an effort to be so represented, and it can well afford to furnish an ear or two of corn, even the best in the district for this purpose. It is impossible for any one person to acquire complete knowledge of all subjects and the best alternative is to know where to obtain reliable information when it is needed. Any touch, therefore, with a center of knowledge, is of real and lasting value. The State College of Agriculture belongs to the people of the State, and is a source of the most up-to-date information in matters pertaining to agriculture and to country life.

The ears of corn selected on Corn Day should be properly labeled at the school with a strip of paper one inch wide on which is written the following information:

....County
District number..................Town of..
...., Teacher
Post office..., New York
...., District Superintendent

The label should be wrapped around the middle of the ear so that it is right side up when the butt is held in the hand; it should be fastened in some way at the back, preferably by gluing. The ears when labeled should be carefully wrapped and mailed by parcel post to

Edward M. Tuttle,
College of Agriculture,
Ithaca, New York

so that they will reach the College not later than January 31, 1916.

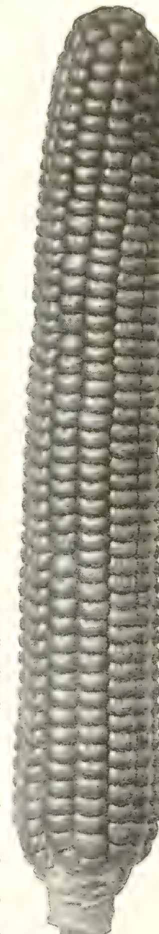
Last year eight hundred and ninety-two rural schools sent corn to the Farmers' Week exhibition. It began to arrive shortly after Corn Day, although the bulk of it was received during the latter part of January. Several schools reported that their ears of corn were destroyed by mice, or in other ways, before they could be sent to the College. For this reason and because every precaution is taken to preserve the corn after it arrives at the College, it would seem better to send the ears as promptly as possible after Corn Day.

At the time of the Farmers' Week exhibition the corn is sorted and arranged for display by counties, supervisory districts, and townships. It is therefore possible for visitors to find quickly the ear of corn that

represents a certain district. Ribbon prizes are given for the best ear of dent corn and the best ear of flint corn in each county. Naturally, in some counties the competition is much more close than in others, and, consequently, the honor of winning is greater. From the fifty or more ears of each type winning the county prize, the two best ears for the State as a whole are selected.

All of the prize ears are returned to the schools from which they came, and for two years past the remaining ears have been given away to farmers and to other interested persons during Friday and Saturday of Farmers' Week. Those taking the ears are asked to put them to some practical use and to write to the schools that sent them to the College. In this way the best ears return to the rural districts of the State, and there is little or no real loss to the State as a whole. Thus a school sending corn even though it does not win a prize, may feel that the effort has not been wasted. If a letter should be received from some person in another section of the State who has taken the ear of corn, the teacher should not fail to encourage the children to answer it because there is an opportunity to give them an interest outside themselves that may have far-reaching results. Letters have been received from schools that have kept in touch with their corn in this way. Old and young have an interest in it.

It is especially interesting to know whether any of the corn that comes to the College from the schools, is the product of prize ears in years past. Last year there was one instance of this kind, and the ear again took the county prize. When such ears are sent, they should be distinguished by a red ribbon and should be accompanied by a letter describing their history.



State prize flint corn, Farmers' Week, 1915. Sent by District 1, Town of Arcadia, Wayne County

By following the work that is done from year to year and by steadily developing and extending the interest and the study, Corn Day will come to have a very real and significant influence on the history of the corn crop in New York State. Enough has been said in this article to enable teachers to make definite plans for Corn Day on December 3. The November leaflet for boys and girls will contain further information designed to stimulate the interest of the children, and it will also contain a complete report of the schools represented in the corn show held during Farmers' Week in February, 1915, and a list of the schools winning prizes.

GENERAL EXHIBIT FOR FARMERS' WEEK, FEBRUARY, 1916

THE EDITORS

What is the purpose of the exhibition of school and home work in agriculture and nature study at Cornell during Farmers' Week? At this time a brief statement of the chief reasons for holding this exhibition are given in the belief that, with realization of its purpose, rural teachers will give the enterprise their earnest support.

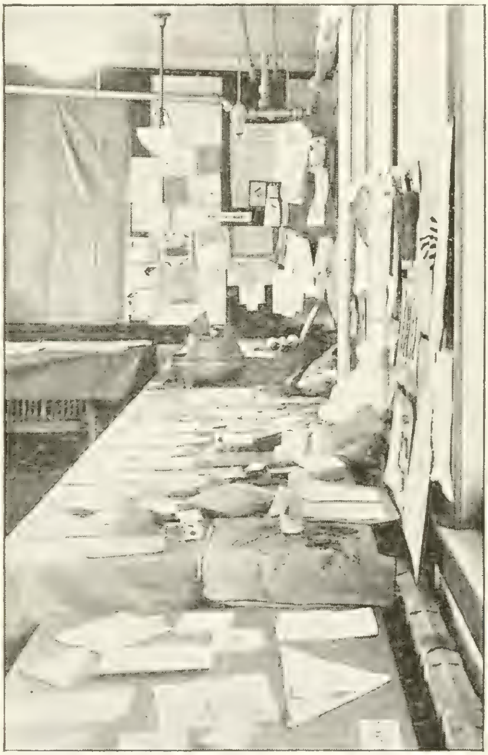
Part of the general exhibit of school work. Farmers' Week, February, 1915. Tree mounts in foreground, poultry feather mounts in background

Country life teaching is comparatively new in the rural schools of the State. If this work, recognized now by all educators as essential in the training of boys and girls in the country, is to receive the necessary attention that will promote its success, young and old in country districts must recognize its dignity and importance as a part of education. When farm and home projects under school direction are considered important for presentation at all gatherings of rural folk, such as fairs, grange meetings, farmers' meetings, county teachers' associations, and the like, the persons who have not understood this new educational movement will be helped to see its importance. A school exhibition provides one means for concrete teaching, and great interest has been shown in the one held at Cornell during Farmers' Week. At this time the College of Agriculture is visited by rural superintendents, grangers, trustees and teachers of rural schools, a number of philanthropic workers in rural districts, and many country boys and girls; all of these persons take back to the country districts new knowledge of this educational work that is to teach children in terms of their environment, and to more closely unite school and home interests.

Another reason for considering the exhibit at Cornell important is the

effort made by the boys and girls to produce a representative piece of work worthy to be exhibited as an example of country life teaching. The fact that their work is to be in competition with that sent from hundreds of other schools, gives impetus to their efforts. If the children are taught to mount and pack the material neatly for mailing, and to communicate with the University concerning it, additional educational results will be accomplished.

A third reason for encouraging an exhibition of school work representing country life study, is that in this way the staff of the College of Agriculture is kept more closely in touch with the boys and girls of school age in the country. This is important because the specialists in the various agricultural lines can best suggest what is important for fundamental instruction, and it is helpful to them to see what children of the different grades can do, and to find some of the strength and weakness in the instruction already given. While the best of the work accomplished by the children cannot be sent to the exhibition, since it must be the study of life, nevertheless their school reports, mounts, and drawings are very suggestive of their methods of working and thinking. The State College of Agriculture is therefore greatly aided in its efforts to cooperate with the State educational system by the helpfulness of rural teachers and children in sending exhibits each year, and this work, illustrating the various phases of the activities in natural history, agriculture, and home making, is becoming a very popular and instructive feature of the annual Farmers' Week. Last year two hundred and thirty-six schools under rural supervision sent exhibits in the several classes outlined in the leaflet; there were four hundred and sixty-one different exhibits in all. These were arranged



Part of the general exhibit of school work. Farmers' Week, February, 1915. Sewing in foreground, bird calendars and weather records in background

in the same room with the corn show. First, second, and third ribbon prizes were awarded in each of the thirteen classes.

In preparation for the next Farmers' Week, February 7–12, 1916, the attention of teachers is called to the twenty classes of articles outlined in this leaflet, and to the instructional matter regarding each class that is given on the following pages. It is hoped that a large number of schools will avail themselves of the opportunity to be represented at the State College of Agriculture at a time when thousands of visitors will be present to view the exhibitions. Attention is called particularly to a few simple requirements.

Part of the general exhibit of school work. Farmers' Week, February, 1915. Corn show in foreground, specimen window boxes in center, and bird's nest mounts in background

1. A single school may send an exhibit in any or all of the twenty classes, but only *one exhibit from each class* should be sent.

2. Each article should be labeled with the class number, with the district number of the school, the name of the township, the name of the county, and with the name and the address of the teacher.

3. The material should be sent to Edward M. Tuttle, College of Agriculture, Ithaca, New York, and should be mailed so that it will reach the College not later than January 31, 1916.

4. First, second, and third ribbon prizes will be awarded in each of the twenty classes, and two sets of ribbons, for subdivisions A and B, will be awarded in the apron class.

5. The prize winning exhibits and all sewing work will be returned to the schools from which they came. No other exhibits will be returned unless a special request is made at the time of sending the exhibits.

The twenty classes and an explanation of the standards for each class. are as follows:

CLASSES OF EXHIBITS

1. One tree mount showing if possible leaves, flowers, fruit, young and old bark, and longitudinal and cross sections of the wood of a single species.

2. One bird's nest well mounted, with description and drawing of the species of bird to which it belonged.

3. Two mounts of poultry feathers arranged on outlines of the birds: one mount of the feathers of a hen, the other mount of the feathers of a cock, both of the same breed and variety.

4. Collection of ten wild flowers mounted on separate sheets, representing selections from the school herbarium, and accompanied by a statement from the teacher of the total number of specimens in the herbarium.

5. Collection of three mounts: one grain, one grass, and one clover.

6. Collection of five weeds mounted on separate sheets, with descriptions of the injury and the method of control of each species.

7. One mount showing the different feeds given to horses in the local district.

8. One mount showing the products from cattle.

9. One mount showing the life history of some injurious insect, accompanied by a description of the method of control.

10. One bird house made by a pupil of the school.

11. One flytrap made by a pupil of the school.

12. One kitchen apron made by a pupil of the school either (a) handmade or (b) machine-made.

13. One stocking with a fair-sized hole darned.

14. One napkin hemmed by hand.

15. One linen napkin ring, handmade.

16. One bird calendar showing observations of the fall or the spring migration.

17. One weather record showing observations for a month.

18. One drawing of natural scenery.

19. One drawing of some natural history object.

20. One drawing of domestic animals.

EXPLANATION OF CLASSES

1. *Tree mount*

The following information on the collection, the preparation, and the mounting of tree specimens, prepared by Professor Moody of the Department of Forestry, will be of value to teachers in standardizing the work.

Specimens of wood, bark, fruit, and leaves can usually be collected by the boys in the woodlot from which the winter's supply of fuel is being cut. In no case should the trees be cut down for the purpose of securing

Specimen mount of white pine

specimens for an exhibit. Pupils must always remember that it takes from twenty to forty years to grow a tree six inches in diameter, and that it takes only five minutes, perhaps, to destroy it. Forest preservation and not forest destruction should be practiced.

The specimens for the illustration were collected in the university woodlots, which have been placed under the management of the Department of Forestry. The rough bark was taken from the stump of a tree that had been cut last winter, while the smooth-bark specimen was cut from a branch and shows very clearly the difference in the bark of the trunk and the limbs of a single tree. The specimens of wood were cut four and one-half inches long, and about three inches wide by three-fourths of an inch thick. The longitudinal section can be smoothed off with a plane or a drawshave. The cross section, which will show the annual rings of growth as well as the presence or absence of heartwood, should be about three-fourths of an inch thick and three or four inches in diameter. The leaves, flowers, and fruit of most species will have to be collected at different seasons and added to the mount to complete the story of the tree.

The wood specimens in the illustration were tacked to the cardboard with No. 8 cut tacks. Leaves and seed of the broad-leaved trees may be fastened with stickers and glue. Attention is called to the two pine cones in the white pine mount. It takes two years for the white pine cone to mature, and the small cone shows the average size of cones at the end of the first season. The mature cone was secured to the cardboard by running a twine string around each end of the cone and through the cardboard.

In order to show the marked difference in the appearance of the bark of young and old growth, it is suggested that specimens be collected, showing these differences, and that they be mounted side by side as shown in the picture. For the schoolroom collection, the specimens can be mounted on ordinary cardboard mounts 10 x 12 inches in size and hung from a nail through the top, in the schoolroom or cabinet.

The exhibit for Farmers' Week in this class should show specimens illustrating the various parts of a single species of tree. It would be most desirable, perhaps, to select some tree given in the list for study this year. On page 1343 attention is called to the necessity for teaching children to respect property rights in making their collections. Opportunities for securing a desired specimen will arise naturally on some of the woodlots in the community, and the boys and girls should be ready to take advantage of these occasions, but should refrain from mutilating a tree simply for the purpose of securing specimens.

2. *Bird's nest mount*

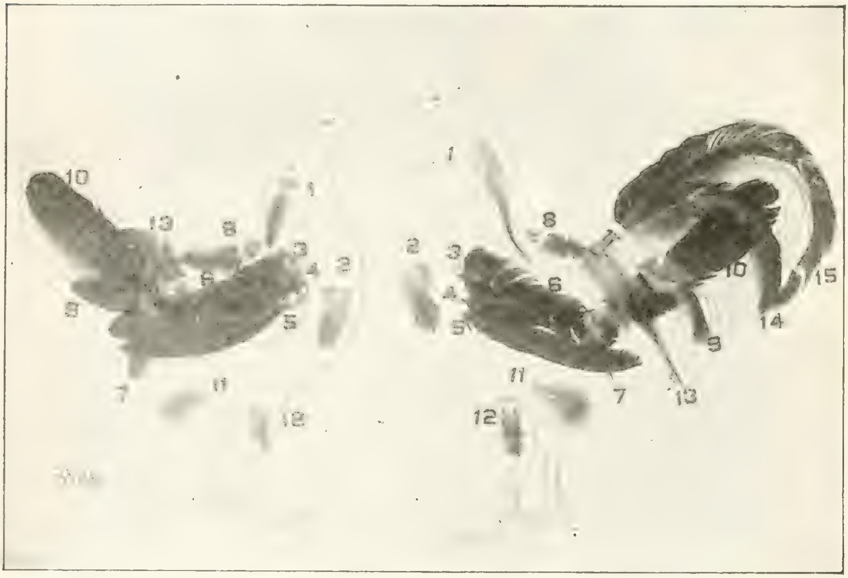
Very few birds use their nests the second season; therefore it is perfectly legitimate to collect and make a study of abandoned birds' nests in the fall of the year. The study will be more worth while if the nests are discovered during the spring and summer while the birds are still in them, so that identification is certain. One bird's nest should be mounted securely on a clean stiff background to which there should be attached a brief description of the bird and its nest prepared by one of the pupils

and also, if possible, a drawing of the bird. Such a mount will constitute an exhibit for Farmers' Week in this class.

3. *Poultry feather mounts*

Mr. Krum, of the Department of Poultry Husbandry, has furnished the following information that will be helpful in preparing the feather mounts, and he has provided the illustration.

Each section of the body of a fowl is given a name and a number, as is shown on this page, as a help in identifying the different kinds of feathers.



Poultry feather mounts

First make a study of the feathers on the live fowl if possible, comparing the shape of the feathers with those shown in the illustration. Make large outline drawings of the hen and the cock. They may be on separate mounts or on the same mount. Then collect the feathers, taking one from each section of the bird and always from the side that will be shown on the mount. The best way to obtain the feathers without injury to the bird is to cut each one off close to the body with a pair of scissors. Mark the feathers in some way as they are collected. A good method is to place each one in an envelope bearing the name of the part from which it came. When the feathers and the outline drawings are ready, the feathers should be fastened in the proper places on the outlines with small pasters. A number should be given to each feather, and the name of the part to which the feather belongs should be placed opposite the corresponding number at the bottom of the mount (illustration). The name of the breed and the variety of fowl represented, should also appear on the mount.

It is important that the mounts of the feathers of the hen and the cock sent for the Farmers' Week exhibition shall be of the same breed and variety. The mounts will be judged on the completeness of the collections of feathers, on the accuracy of placing them, and on the neatness of the work, including the outline drawings.

It may appear to some persons that the collection and study of feathers is unprofitable, but it affords an excellent starting point from which to interest children in poultry, to teach them to handle the birds, and to train their powers of observation.

4. *Ten herbarium specimens*

Each rural school should gradually be collecting an herbarium of the wild flowers of the neighborhood; many schools already have very fine collections. The exhibit in this class should consist of ten specimen sheets from the school herbarium, each sheet representing a single plant included among the wild flowers. It would be desirable, if possible, to include as many of the plants for study this year as are available. Comparatively few of the wild flowers are available after school begins in the fall, and this class may, consequently, be more difficult to secure unless there are herbarium specimens that have been prepared during the previous spring. Accompanying the ten sheets, there should be a statement of the total number of different kinds of wild flowers that are included in the school herbarium in order that visitors may obtain some idea of the completeness with which the school has studied this subject.

5. *Grain, grass, and clover mounts*

The State syllabus requires that each year one grain, one grass, and one clover shall be studied. The exhibit in this class should consist of three separate mounts on uniform backgrounds, one of a grain, one of a grass, and one of a clover, showing the complete plant in each case.

6. *Five weed mounts*

The exhibit of weed mounts should consist of five separate sheets, each sheet showing a specimen of some injurious weed. Attached to each mount there should be a short statement of the injury that the weed does and of the methods of controlling it. Many of the weeds can be obtained in the fall of the year, and it should be easy to meet the requirements in this class after school opens.

7. *Horse feed mount*

The horse is given for special study in the animal division this year. In this connection it would be interesting for schools to endeavor to pre-

pare a mount showing specimens of the various feeds given to horses in the local districts. Both the grain feeds and the forage feeds should be represented, and it is left to the ingenuity of the various schools as to how they can best be attached to the mount. Awards will be made on a basis of the apparent amount of local study, the arrangement, and the educational value of the exhibit.

8. *Cattle product mount*

There are a large number of products obtained from cattle, and some teachers will be interested in having the boys and girls make a study of some of these products and in obtaining specimens, if possible. Two years ago a school sent to the general exhibit, which was not at that time divided into specific classes, a mount showing the products that are obtained from sheep and all the various ways in which wool is manufactured. It was a most instructive mount, and it has seemed as though some similar effort could be made in the study of the products from cattle. There may be some little difficulty in devising ways to preserve and mount such things as milk, butter, and cheese, but schools will probably be able to solve the problem in some satisfactory way by the use of small air-tight bottles, and the like. The exhibit in this class should be of special interest if well worked out.

9. *Injurious insect mount*

It is well known that the method of controlling an injurious insect depends very largely on the life history of the insect; it is valuable, therefore, to become familiar with the life histories of injurious insects. The exhibit in this class should consist of a mount showing the complete life history of some one injurious insect in the local district and including a short description of the method of controlling the insect, which shows how the control is related to the life history.

10. *Bird house*

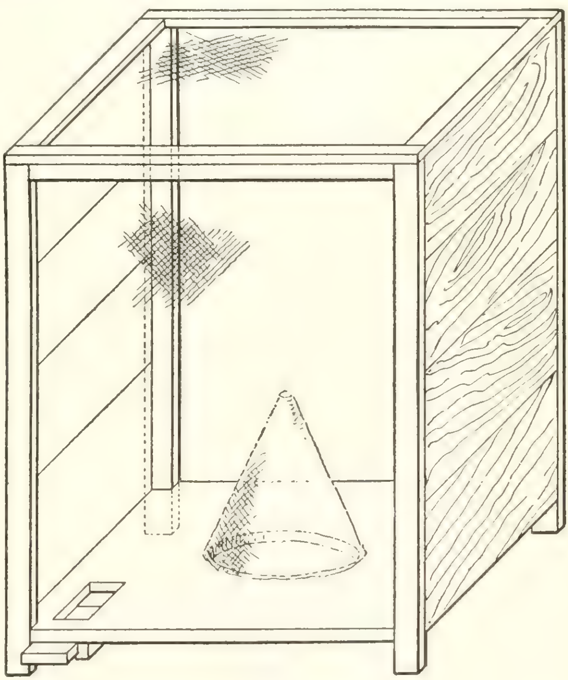
Thousands of bird houses are made by boys and girls during the year. Many of them are well and correctly made, as is evidenced by the fact that they are approved by the birds and used as homes. It sometimes happens, however, that a bird house is not suitable for the purpose for which it is designed, and it is desirable to recognize a few of the standard requirements. In the first place, for all birds except purple martins, no house should be built with more than one compartment and one entrance; this compartment should not be too large — from six to eight inches square is ample. The opening should vary somewhat with the kind of bird the house is designed to attract; one inch in diameter is about right for wrens and chickadees, and an inch and a half for bluebirds and swallows.

Secondly, bright-colored paints should not be used on bird houses. A natural-colored wood that has been exposed to the open air for some time, is best. Birds, in making their nests, seek protection, and will not be attracted by a bird house that is painted a shiny white, blue, red, or other bright color. The bird houses sent to the College for the Farmers' Week exhibition will be judged on their suitability and their workmanship.

11. *Flytrap*

There are various simple flytraps, which can be made by boys and girls. The following is a description by Dr. Winslow, of the State Department of Health, of one such trap that has proved satisfactory:

The trap shown in the illustration may be made from a grocery box by substituting wire netting for the top and two sides, cutting a round hole in the bottom, and inserting a wire cone with an eight-inch opening at the bottom and a half-inch opening at the top. A suitable bait — a fish's head, for example — may be placed under the box, and the flies that seek it will fly from it upward toward the light and through the small top opening into the box. Dead flies may be shaken out through a small opening ordinarily closed by a sliding door.



Flytrap

There are many modifications, and it is not necessary that the traps sent to the College for Farmers' Week should conform to this pattern, but they should be simple, easily made, and practicable.

12. *Kitchen apron*

Miss Blackmore, of the Department of Home Economics, has prepared the following suggestions that will be of assistance to girls in making a kitchen apron. Teachers will be able to explain the suggestions to the

children, and to assist them in standardizing their work and making the effort that they expend of value. It has seemed desirable to separate the machine-made from the handmade aprons, for the two kinds are distinct, and will be judged separately. Wherever a sewing machine is available, it is not economically worth while to make an apron by hand.

Pattern.— Use any pattern desired that is appropriate to the purpose for which the apron is intended.

Material.— Gingham, print, percale, long cloth, indianhead, cambric, muslin, and linen are all suitable materials.

Trimming.— Stickerei braiding, scalloped tape, bias binding, ruffles, stitching, or bias bands of the same material, are good for trimming. It is better to keep the apron in one color as much as possible, not using complementary or contrasting colors.

Making.— (1) Placing pattern. The general rule is to place the largest pieces of the pattern first and the largest end of the pattern toward the cut end of the goods. Pin all of the pattern in place before cutting any part.

(2) Cutting, a or b. (a) Trace around the edge of the pattern. Remove the pattern and cut beyond the tracing the seam allowance if the seams are not allowed on the pattern. (The seam allowance depends on the type of seam used. An enclosed seam is most appropriate for any wash garment. See general directions at end.) (b) Cut the cloth allowing for seams while the pattern is still pinned to the goods.

(3) Basting. Match and pin together corresponding notches as indicated by the pattern. Then baste the garment together always holding the more bias edge toward the sewer. (Whether garment is basted on right or wrong side depends on the type of seam used. The kind of seam must be decided on before the garment is cut.)

(4) Fitting. Try the garment on and make any necessary alterations, rebasting all changes.

(5) Stitching seams. Stitch seams following general directions given under that heading.

(6) Hems. First baste the hems on the back sides of the apron from the top to the bottom. Then baste in the bottom hem and try on the apron. If the apron is slightly circular at the bottom, lay the garment out flat on the table, wrong side up, and turn the hem away from the sewer on to the garment. Match the seams. Any extra fullness should be placed in small plaits before the last turn of the hem is made. Plaits should all turn in the same direction. The second turn should preferably be one-quarter inch wide and not more than one-half inch. The edge must be clean and straight before it is turned in. Make the second turn, baste the hem, and stitch it. The stitching of the bottom hem should only extend as far as the stitching of the back hems, and the back hems should only be stitched down to the stitching of the bottom hem. The open ends of the hem should be overhanded together. If there is to be a band on the apron, it should be sewed on at this time.

(7) Trimming. All desired trimming should now be applied. If a pocket is desired, it should usually be placed on the right side, a few inches below the waist line, or wherever it is most convenient for the wearer.

(8) Buttonholes. Buttonholes are worked on the right side of double material. The work should be done from right to left. The thread must be turned about the needle in the direction in which the work is advancing. For flat buttons the hole should be cut the length of the diameter of the button, for ball buttons somewhat longer, and always even with the thread of the material. Hold the buttonhole slanting across the first finger of the left hand, with the edge of cloth toward the outside of the hand. Begin at the lower right-hand corner.

First strand the buttonhole by taking one or more long stitches to the extreme end of the slit and back again on the opposite side. The buttonhole stitches will cover these, and will be strengthened by them. Then overcast over the stranding using about three stitches on each side of the hole.

Now bring the needle to the right side close to the edge of the slit at the lower right-hand corner. Take the first buttonhole stitch by putting the needle into the slit close to the end, and bring it out far enough from the edge of the slit to avoid danger from raveling. Before pulling the needle entirely through, put the thread from the eye around from right to left under the point of the needle. The needle should be drawn away from the sewer so that the purl comes on the edge of the slit. Make the stitches upright, of the same depth, and with about one thread of material between each stitch.

At the end that will stand the strain of the button, make a fan. The stitches of the fan are slightly longer, and the purl is pulled a little more on top. There are usually from five to nine stitches in the fan, the center stitch always in direct line with the hole itself. When the other end of the hole is reached either a fan or a bar may be made. To make the bar, bring the needle out beyond the slit on a line with the depth of stitches just completed. Strand several threads across the end, then make blanket stitches over these threads, pulling the purl toward the buttonhole. The two or three stitches opposite the hole should be caught into the material in order to hold the bar from slipping.

Be sure that the thread is long enough — about three-quarters of a yard will make a medium-sized hole. Coarse thread may be used for coarse material, but for medium gingham No. 60 or No. 70 is coarse enough.

(9) Buttons. Always sew on buttons with a single thread and without a knot. Take a backstitch in the top side of the cloth at the point where the button is to be placed. Run the needle through the button and down through the other hole. Place a pin under this stitch on top of the button and continue making all stitches over the pin. Remove the pin, bring the thread to the underside of the button, and twist the thread from the needle around the stitches between the cloth and the button several times, making a shank. Fasten the thread through the shank.

(10) Press the apron.

General directions.— Good machine stitching means from sixteen to eighteen stitches per inch.

French or stitched fell seams are most appropriate for a wash garment. A French seam is a seam within a seam. In order to make it stitch two wrong sides of a garment together. Then trim the edges to within one-eighth inch of the seam, open the seam and crease it flat, and turn the

cloth placing the two right sides together. Baste the seam on the wrong side close to the edge, and stitch it deep enough to include all unfinished edges. A stitched fell always appears on the right side of the garment. Place the two wrong sides together, baste them, and stitch them about three-eighths inch from the edge. Remove the basting. Decide which way the seam is to turn (generally away from the bias edge), trim the under edge down to within one-eighth inch of the stitching, turn the upper edge over it, and double the raw edge under about one-eighth inch. Press the seam down flat on the garment, and stitch it very close to the edge.

13. *Stocking darning*

Miss Titsworth, of the Department of Home Economics, has prepared the following instructions on darning, which will be helpful in preparing the exhibit in this class.

Use a stocking with a hole not larger than a nickle. The darning cotton should be chosen so that it will not make the mended place heavier than the rest of the stocking. It is better to use fine darning cotton doubled than coarse darning cotton. The part with the hole may be basted on a piece of tablecloth, or stiff paper, or held over a darning ball, but in the latter case the work is likely to be stretched so that it does not lie smooth.

Work on the wrong side. Begin at the lower right-hand side of the hole to take up a few small stitches; then cross over the hole, and take up a few more stitches. Work back and forth over the hole in this way, leaving a small loop at the turning point to allow for shrinkage of the darning threads, until the hole is filled with threads close together, and the ends of the threads form a diamond shape. This is done so that the strain of the darn will not be in one line, as it would be if the darn were square. Put in the crosswise threads in the same way, and darn over and under the lengthwise stitches, alternating with each return thread. The frayed edges of the stocking should be caught as they happen to come, and held firmly between the woven threads.

14. *Napkin hemming*

Miss Blackmore has prepared the following suggestions on napkin hemming:

Use the napery stitch, or overhanding, on linen. Ordinary hemming is not strong enough for damask, and overhanding is used in its place. This work takes a long time, and it is therefore not profitable to put it on an inferior grade of linen.

Turn and baste as narrow a hem as possible, for the narrower the hem is, the better the effect. The hem should then be turned back on itself, the exact width of the hem. Overhand the fold to the main body of the linen.

Overhanding is done from right to left. The form of the stitch is a slanting line meeting a straight one. The work is done on the wrong side of the material so that the slanting part of the stitch is on the wrong side, and the straight part on the right side. The straight part of the stitch

should fall in the direction in which the threads of the material are woven, and thus show less.

The material should be held horizontally in the left hand with the edges lying along the first finger. The thumb and the first finger should keep the material in place. In each stitch the needle should point to the chest. A knot may be used but is not so neat as slipping the thread through the folded edge at the beginning, and catching it in the first few stitches to make it secure. The stitches should be several threads deep, and should not be crowded in order that a flat seam may result. When opened the hem should lie perfectly flat, and the stitches should be scarcely visible.

15. *Napkin ring*

Miss Titsworth has prepared the material on making a linen napkin ring. Special attention in this class will be given to the buttonhole and to the way the button is sewed on.

Use two pieces of linen large enough to make an oblong two and one-quarter by seven and one-quarter inches and allow at least a half inch margin around the oblong. One end should be cut square, and the other should be a rounded point. Before marking and cutting the linen make a paper pattern.

The linen may be new or a part of an old white tablecloth. The pieces for the napkin ring should be cut so that the long threads run with the length of the piece. Baste the two pieces together firmly. With a small thread spool mark even scallops around the edges of the oblong, and embroider them using a medium-sized embroidery floss. The stitch used is called embroidery buttonhole, and is worked from left to right with the thread from the work carried under the needle from left to right — the reverse of the true buttonhole. The stitches may be padded or worked flat, but, for the napkin ring, it is just as well to work them flat and close together.

One-half inch from the pointed end, work a buttonhole; one inch from the square end, sew on a small button (page 1395). Press the napkin ring flat, and send it unlaundered; therefore try to keep it as clean as possible.

16. *Bird calendar*

The bird calendar should be an actual record that has been kept in the school of the migration of the birds either in the spring or the fall, and, in general, should show the name of the bird, the date on which it was seen, the place where it was seen, and the name of the person who made the observation. The calendar may be illustrated artistically if desired. Several very attractive ones were received last year. More consideration will be given, however, to the amount of actual study that is evidenced, than to the artistic character of the calendar.

17. *Weather record*

Many schools are in the habit of keeping weather records during the year, and have devised a number of original schemes for doing this. The

exhibit in this class should consist of an actual weather record kept by the school for one month.

18. *Drawing of natural scenery*

In judging the drawings of natural scenery, preference will be given to scenes drawn from local views. It is often possible to make a drawing that is full of interest of a scene from a schoolroom window. Original work rather than copy work should always be sent.

19. *Drawing of natural history article*

There are many objects in the natural world that are excellent subjects for drawing, and the exhibit in this class will consist of such a drawing. Anything may be represented in this way — leaves, flowers, fruit, trees, insects, birds, wild animals, and the like.

20. *Drawing of domestic animals*

Children are always interested in drawing domestic animals. The exhibit in this class will consist of a single drawing of one animal or a drawing of a group of animals.

Prize winning boys, 1914 school fair First Supervisory District, Delaware County

THE SCHOOL AND THE HOME

Editors' note.— The following is a series of communications and articles dealing with various phases of work in natural history, agriculture, and home making. These subjects are the means of uniting more closely the school and the home, and of affording boys and girls an opportunity for practical endeavor under educational direction.

University of the State of New York
Albany, New York, July 1, 1915

To the Editors of the Cornell Rural School Leaflet:

In response to your request for a statement concerning contest or club work, I make the following suggestions to all those interested in the boys and girls who live in the country.

1. Let us use the educational possibilities of the country for the development of our boys and girls rather than use our boys and girls for the development of agriculture, an idea, an institution, or an individual.

2. Let us change the name contests or clubs to projects. The term club implies an organization separate from or at least not identical with the school. The word contest implies a primary aim to beat some one else rather than to secure the greatest individual development. A project is a piece of productive or constructive work with study directly related to that work.

3. Let us minimize cash prizes, but magnify honesty and personal effort.

4. Let us recognize all commendable projects rather than select only one or two from each class.

5. Let us think of the boys and girls who are carrying on projects as operators rather than as contestants or club members.

6. Let us classify projects on the basis of size and comprehensiveness of operations into two general groups, *junior* and *senior*.

7. Let us plan junior projects for boys and girls between the ages of eight and fourteen, and senior projects for boys and girls between the ages of twelve and eighteen.

8. Let us concentrate on a few projects until we have had experience enough to warrant branching out into several lines. Junior and senior potato projects for boys and junior and senior projects in tomato canning for girls, make plenty of work for a year.

9. Let us look to the district superintendent of schools for the organization of this work in his or her district, and to the teachers in each school for the incorporation of it into the school program for the year.

10. Let us expect from the Education Department direction and assistance in the organization of the project plans; from the State College of Agriculture a correspondence course for teachers and bulletins on subjects

related to the projects, from teachers of vocational agriculture assistance in summer visitation of projects; and from farm bureau men assistance in converting parents to the idea that they owe more to their children in an educational way than the payment of the school tax.

11. Let us remember that agricultural and home-making projects are but a part of an educational plan. Exhibits and fairs then ought to represent all school activities.

12. Let us remember that the small local fair or field day means reaching the people at home who are really interested in and know the boys and girls.

Sincerely yours,

Layton S. Hawkins

Specialist in Agricultural Education

AGRICULTURAL CONTESTS

RUTH M. JOHNSTON

(Superintendent of Third District, Lewis County)

My first attempt at agricultural contests was in 1913. I decided to try the experiment in one township only. Accordingly I asked the strongest grange in my district to help me with money for prizes and to furnish their hall and assistance for our picnic dinner on exhibit day. As I expected, my proposals were not greeted with enthusiasm at first. However, after about five trips to the village the vote to help was carried in the grange by a majority of one, and we set to work.

I was fortunate in having a very capable and intelligent committee of grangers to assist me in making the plans. We decided to have the contests as simple as possible, a potato-growing contest for boys and girls under sixteen and a bread-making contest for girls between twelve and sixteen. Prizes were five dollars and two dollars and a half in each case. We made the Cornell Rural School Leaflet dealing with agricultural contests our guide and final authority.

As soon as our plans were settled, I drove one day to the ten schools in the township chosen, a drive of about thirty-five miles over very hilly roads, stopping at each place long enough to explain the contest work and leave enrollment blanks and leaflets on the subject, and then hurrying on to the next school. At each school I tried to emphasize the following points:

1. That while we wished as many pupils as possible to enter the contests, we wished them to do so voluntarily.

2. If they did enter we expected them to work until the end, no matter how tired they might become, and to exhibit the results of their work whether they were proud of them or not.

3. That we expected them to be absolutely honorable in carrying out the rules of the contest and in doing the work without help.

4. That they had better not enter the contests unless they could be good losers; that it was better to be game about not securing a prize than to be conceited about winning one.

5. That we expected them to do the work carefully and to learn all they could about potato growing or bread making.

I talked with the teachers about intelligent direction of the work and about keeping up the interest of the pupils as long as school was in session, and urged them to take up the topic of potato growing in connection with the work in elementary agriculture.

Twenty-four boys and sixteen girls enrolled. Of these on exhibit day the next October, twenty boys and sixteen girls entered exhibits. One of the missing boys was unfortunate enough to have his potatoes all eaten up by the hens; another had moved from the township. During the summer the father of one of the contestants sold his farm located six or seven miles back on the hills and moved into the village. When the sale was made he reserved the land on which the boy's potatoes were planted, and his son, about twelve years old, went back and forth all those miles to give his potatoes necessary care and to dig them in the fall. It is needless to say that he had the right kind of a father. As I had known how manfully the boy had worked, I could not help hoping secretly that he would win a prize. When the prizes were announced on exhibit day, and his name was not among the winners, I watched the boy's face. If there was disappointment in his heart, he gave no sign. I was glad when a public-spirited man gave fifty cents to every contestant who had completed his work, but had not won a prize.

Through the kindness of the State College of Agriculture, two judges were sent to us, which added greatly to the enthusiasm and interest of the grangers. On exhibit day there were about two hundred and fifty persons in attendance despite the fact that the morning was very rainy, and that the great majority present had to drive through deep mud. After the dinner we had a brief program at the close of which both judges from Ithaca made remarks and the prizes were awarded. Two of the smallest boys who had entered the contest, so small that I had felt doubtful the spring before about encouraging them to attempt the work, won the potato prizes. Most of the potatoes exhibited were very good specimens, and many of the boys went home contented because they had sold their product at a good price to persons who wanted them for seed. The grangers seemed pleased with the results and began to talk that day about what we could do the following year.

In the spring of 1914 there was no difficulty in getting the Turin grange

to vote money. In fact they voted more than they had the year before, and I was fortunate in having the same wide-awake committee to assist me. We decided that in each contest it would be wiser to have more prizes of less value. It was also agreed to have not only a potato-growing contest, but corn and vegetable contests as well, also a bread-making contest. We were anxious to have the bread and the potato contests a second year because we all felt that doing the work a second time ought to clinch a few facts in the children's minds, and they ought to learn much more than from the first trial.

We decided, also, to make our exhibit day more especially a school day than it was the year before. Each school was asked to contribute one selection to the program. They were all to sing patriotic songs together. There was to be an opportunity for any pupil to exhibit anything he had made or raised, whether it was entered in the regular contest work or not. There was also to be an exhibit of school work. All these things added greatly to the interest when exhibit day came. The day before the exhibition I felt a trifle uneasy lest the entertainment part of our plans were not carefully enough worked out. So I drove up to the village school and appealed directly to the boys and girls in the academic department to constitute themselves an entertainment committee the following day, to which appeal they responded most heartily. They did much to add to the success of the occasion.

On exhibit day the hall was as well filled as it could be comfortably. The exhibits were good except that the corn was conspicuous by its scarcity. The program was unquestionably a success. Aside from the prizes we had blue and red ribbons, which were awarded not only for the regular contest work, but for other exhibits as well. At the close of the program the exhibitors desiring to do so, were allowed to auction off their products, causing much amusement, and, in some cases, much gratification to the young gardeners.

Aside from the Turin contest, there were two others in my supervisory district last year. After noticing what Turin had done the year before, the Greig grange volunteered ten dollars in prizes and asked me to start corn-growing and bread-making contests in their township.

We had an exhibit day similar to those described. Much of the corn was not so satisfactory as in other cases because the contestants had trouble in obtaining good seed. Lewis County is not a corn-growing county. The season is so short that corn is almost always cut by the frost before it ripens, and most of the corn raised is used for silos. While we had some very good corn exhibits, still there was not a large enough proportion of it good. The chief fault was in our not securing good seed early enough and in not starting instruction in corn growing earlier. The

district superintendent was to blame for this, not the grange. I think these mistakes have been corrected in the contest held this year in the town of Greig.

In the township of Martinsburg we held a contest assisted only by a few ladies, one very public-spirited woman giving the prizes. The two exhibits for which prizes were offered were bread and potatoes. We had some excellent potatoes, which represented faithful work on the part of the contestants. Some very good ones were brought in by a little girl nine years old, who had done all the work herself except the plowing, and who seemed to have learned more on the subject than some of her older competitors. The general exhibit from this town was unusually good, and the attendance large. We were not so successful in holding all our children who had enrolled as I had hoped, but I attributed this to two reasons. The township is so large, and the schools are so scattered that it was absolutely impossible for me to reach all of them personally before the pupils enrolled. Also, in a large section of the township there is a very shifting population, some families continually moving in and out.

In reviewing the contest work of the past two years, I can see several ways in which it must be improved if it is to be of the fundamental value desired. We must have more definite supervision of the work during the summer when the schools are closed. For this reason one of the granges this year has appointed some one in every section of the town to watch the work of the boys and girls, to consult with them, and to receive reports from the contestants in that locality at least once during the summer.

I am inclined to think that the girls sometimes have been too haphazard in bread making, that they have often waited until the last few weeks, and then have made hasty experiments instead of doing intelligent work all summer. The conditions for the baking contests this year require that the article in question shall have been made a certain number of times before a contestant shall submit an exhibit for a prize.

This year plans for contest work were completed in February so that definite detailed instruction might be given in the schools beforehand rather than in a great rush as the contestants are enrolling. This also gave the contestants an opportunity to look for the kind of seed they want. In the town of Greig the grange has furnished all the seed corn and potatoes, so that the contestants will have an equal opportunity in this respect.

Whatever has been done in this supervisory district in contest work has been of extremely elementary character. Many of the pupils have done excellent work, but it is obvious that we are still far from accomplishing what we wish to do. However, the standards have been raised a little each year. I think now that the sense of honor many of the boys and

girls have shown in exhibiting results of which they were honestly ashamed, simply because they had promised to do so, and in refusing proffered aid, may be worth infinitely more than the good ears of corn that failed to appear in some particular cases.

SCHOOL CLUBS AND SCHOOL CONTESTS

M. G. NELSON

(Superintendent of Fifth District, Delaware County)

The editors of the Cornell Rural School Leaflet have asked me to relate my experience with club work. It has been experimental, and, like all experiments, contains errors. The slogan "Back to the farm" does not appeal to me, but "Stay on the farm" does. The principal reason I left the city and entered on my present work was that great opportunities are given a district superintendent to influence the rising generation to stay on the farm and to prevent the drift toward the city shops. Too often have I seen my boys, after a year in the factories, lose every vestige of color and take on that sickly palor caused by smoke, bad air, and lack of sunlight.

A certain boy disliked to milk. In his mind this department of farm work was a necessary evil. It happened that his father purchased a Babcock testing machine. The boy learned to operate it and proceeded to test the various cows. Milking became a little more interesting. It occurred to him that a cow was a machine, which must be rightly managed in order to produce the best results. He began to realize that the quality and the amount of food given to the cow had an influence on the amount of milk produced. While before this boy had seen nothing but drudgery on the farm, he came to see, through his newly opened eyes, that farming is a business that furnishes many interesting problems to the thoughtful mind and that the working out of these problems is most fascinating. This boy by accident discovered that farming is an occupation furnishing infinitely more interest and freedom than the front platform of a trolley car or work in the shop can ever give. He is at present managing a farm of two hundred acres and having worlds of fun doing it.

The agricultural club reaches such boys not by accident, which happens to a very few, but by design, which touches many. In the Fifth Supervisory District of Delaware County we have an experiment club and a boys' and girls' agricultural club the work of which culminates in an annual school fair. The experiment club is composed of the teacher and the pupils of District No. 4 of the town of Davenport, which is a general farming community. This district supports an ordinary school, which has small but level and well-drained grounds. The teacher of this school is a

graduate, not of the high school, but of the training class, which she entered on eighteen academic counts.

The experiment club was organized in the early spring. It was decided to have a portion of the school grounds plowed for the work of this club, and one of the residents of the district offered to do this. The children did all of the remaining work.

The plat was divided crosswise into four equal parts. The first part was treated with a dressing of nitrogen, the second with phosphoric acid, the third with potash, and the fourth with a mixture comprised of equal parts of these three fertilizers. The plat was then divided lengthwise into three equal parts. The first part was planted to soy beans, the second to corn, and the third to potatoes. In planting the potatoes, each seed potato was cut into four parts, and each part was planted in a separate hill. The three crops were cultivated and kept free from weeds. A wire fence was built around the plat to keep out stray cattle.

The soy beans proved to be a failure, but the corn and the potatoes did well. When the corn was ready to harvest, the pupils concluded that the ground treated with nitrogen grew the largest stalks, that treated with phosphoric acid the most mature ears, that treated with potash a complete failure, and that treated with the mixture a little better crop than that treated with potash, but not so good as with the nitrogen or the phosphoric acid. It was decided that, on this ground, if ensilage was desired, nitrogen should be used, that if well-matured ears were desired, phosphoric acid should be applied.

When the potatoes were harvested, the four hills from the same seed potato were piled together, and the best piles saved for seed. The pupils concluded that the potash treatment produced the best yield, while the mixture produced the next best yield. The nitrogen treatment produced rank vines, but poor yield.

Unfortunately there was no untreated check plat. The plat of ground at the disposal of the school was too small to be divided into five parts. It is hoped that in the future more land can be secured.

After all crops were harvested, a cover crop of rye and winter vetch was sown. In the spring this will be plowed under; one-half of the plat will be treated with lime, leaving one-half as a check; then oats and grass seed consisting mainly of clovers will be sown on the whole plat.

I do not consider that the outcome of these experiments is important; however, I do consider that the interest in rural problems engendered in both teacher and pupils is of great importance. I hope that District No. 4, Davenport, has blazed a trail that all the districts in the Fifth Supervisory District of Delaware County will follow. The teacher, Miss Blanche Burdick, and the pupils will see to it that all other districts will be at least

one year behind in this work, for they have not only an interest in rural studies, but a determination to succeed.

The agricultural club furnishes both weapons and ammunition with which to check the city migration. The people who inhabit Delaware County are, as a rule, very conservative and chary of new and strange movements. The school agricultural contest was new to the county, and few had even read of this movement in the West. They did not think that it would be possible to carry on such a club and were loath to support the movement.

The first agricultural club was organized during the winter of 1913. The children were eager to take part and to hold what was called a school fair. In spite of all efforts, the parents and the older people looked on the contest as a joke. The fair was held October 30. Three rooms in the Franklin school building were filled with exhibits. A majority of the estimates placed the attendance at about five hundred persons. The adults came out of curiosity, they remained out of interest in the exercises, they approved of the exhibits, they endorsed the movement, and they insisted that it be made an annual feature. A few days after the fair several schools were asked the question, "Shall we hold a school fair next year?" If there was a dissenting voice, it was lost in the chorus of assent.

Plans for the 1914 contest were begun at once. Registration cards were printed, three inches by five inches in size so that they might be filed in a standard cabinet. Each contestant filled out the cards in duplicate and had his parent sign one of them. The duplicate card was for the county farm bureau agent, who could assist in supplying the contestants with the best cultural directions. Contests were arranged for in canning, corn raising, garden making, potato culture, poultry raising, and bread making. Each contestant was furnished with a complete set of directions giving the best methods of working out his individual contest. Considerable use was made of the Cornell Rural School Leaflet on agricultural contests.

From time to time written communications containing helpful suggestions and words of encouragement were mailed to the contestants. Each boy and girl was encouraged to write to me, telling how the contest work was progressing. Many contestants did write. One boy wrote to me each month, and it may be interesting to know that he took the sweepstakes prize for the garden exhibit. As often as possible personal inspection was made of the work being done. However, a district superintendent does not often have the time to inspect personally the progress made by the contestants.

In September printed blanks were sent out for the written report, an

outline of which was included with the contest instructions. These blanks were to be returned about one week before the contest day.

In 1914 the contest was held on October 16. During the evening of October 15 it began to rain. It rained all night and was still raining the next morning. Many times during the past two years I have wondered what I should do if it rained on the day of the school fair. I perceived that this question was about to be answered. It was answered. As soon as the telephone office was open, persons began to ask "Will the school fair be postponed?" My sincere wish was to have it postponed, but, of course, postponement was not possible. A few exhibits, a few wet and bedraggled children, and a few ill-natured parents, were expected.

It had been planned to register the exhibits from nine to ten-thirty o'clock. From ten-thirty to twelve, while the exhibits were being arranged and judged, an athletic contest, consisting of dashes, high jump, broad jump, slack rope climbing, tugs of war, and the like, had been planned. From twelve to one a basket lunch under the trees was scheduled. The exhibits were to be inspected at one, and the address of the day was to be given at two, followed by the award of prizes.

How early the exhibits began to arrive was a disputed question. Suffice it to say that eighty-three separate exhibits were registered. The rooms were crowded at ten-thirty, and it was still raining. The use of a hall was secured, and the games were held there. The children were kept busy until after twelve o'clock.

While the athletic contests were in progress, the exhibits were being judged. When each exhibitor registered, the person in charge took down his name, his age, his school district, his town, and the kind of exhibit. Then the exhibitor was given a card bearing a number, the age of the contestant, the district number, and the town, which card was attached to the exhibit. Thus the judges did not know to whom they were awarding the prizes. After the judging was completed, the ratings were placed opposite the proper numbers on the registration sheet, which of course gave the contestant's name. Suitable ribbons were placed on the prize-winning exhibits. In addition to the prize ribbons each exhibitor was given a badge when he registered, which signified that he had completed his contest work. When the prizes were awarded both the exhibitor's number and name were given.

Our aim in the agricultural contest is to teach the child to perceive the honor there is in carrying a piece of work to its logical conclusion and not to work for a prize alone. In order to realize this aim better, we try not to have the prizes too large and to distribute them so that about fifty per cent of the exhibitors shall get something, however small it may be. As I have before stated, we had eighty-three exhibits this year. All the prizes were not won, yet thirty-five were awarded.

The basket luncheon was held in one of the high school rooms, and the exhibits were inspected by parents, children, and friends at one o'clock. Mr. Edward M. Tuttle was present and talked to the children and older folk at two o'clock.

About fifty per cent of the children registered in the spring completed the contest work. I believe that in most cases the children who failed to complete the work were not to blame. I shall give a few illustrations. The wet weather in June and July killed much of the corn. The boy who won the poultry sweepstakes prize last year set fifteen eggs and hatched thirteen fine chicks. He took the best care of them and raised twelve. The rule was that each poultry contestant was to exhibit one cockerel and one pullet. This boy found that he had all pullets and was debarred. Another boy in the same school district raised all cockerels. Floyd Clark had a fine garden, yet when he come to harvest it, he found that all of the root crops had spoiled. However, he took the first prize on cabbages, and both he and his father were as proud as kings.

The highest prize awarded was five dollars in cash as a sweepstakes prize. It happened that this prize went to a boy who sent his fowls in care of his sister, for he was sick in bed. We find that cash prizes are satisfactory. Merchandise is of great value especially if it is something that the pupil can keep. Pure-bred fowls, aluminum cooking utensils, and many other things are excellent, while pocket knives never come amiss.

Two of the first questions asked by those who are planning to organize these contests are: "What is the expense, and how do you raise the necessary funds?" Our expenses for this year's contest and fair were: postage and supplies, $5.95; printing, $5.50; judges, $3; and prizes, $47; a grand total of $61.45. Several prizes were not earned, among them being one of twenty-five dollars for a half-acre potato contest for boys over sixteen and under twenty-one years. As a rule the bill for printing will be nearer $15 than $5.

It was hard to get contributions for the first contest. The people were skeptical. When the account was closed, there was a deficit of about $20. This year there have been ten small contributions to one of the year before. Small contributions are the ones to seek. The ultimate aim with us is to get the support of each family. Only fifteen or twenty cents from each family will be necessary to furnish funds in plenty; yet these people by contributing will become cooperators, and as cooperators will have a deeper and more lasting interest in the movement. Some communities desire to contribute as school districts. This year the smallest and poorest district contributed $2.75. This district offered to contribute and was pleased to feel that it had a share in the enterprise.

I am positive that the period of financial trials is passed. Even now nearly enough aid has been secured to finance the contest another season.

Is all of this trouble and work worth while? Let me answer this questions by asking some others. Is it worth while for a boy to be responsible for some one thing for an entire season? Is it worth while for a girl to learn to make better bread than her mother, and to gain from the experience an intelligent interest in domestic work? Is it worth while for young people to see a pleasant side of rural life? Is it worth while for an entire community to assemble with children and teachers in honor of the schools because of interest in the efforts of the boys and girls? Evidently the people of Delaware County think it worth while when nearly five hundred of them care to journey from one to twenty miles in the rain and mud to take part in a contest exhibit.

CHEMUNG COUNTY CONTEST WORK

MARTHA M. COX MCWHORTER

(Superintendent of Second District, Chemung County)

The contest work in Chemung County has done a great deal to unite the home and the school. The aims of the work have been: first, to make Chemung County a poultry center; second, to raise more vegetables in the home gardens; and third, to make more baked stuffs in the home.

Some of the results of the contest work are: first, home labors have been greatly dignified, putting them on an equal basis with school work; second, boys and girls who were aiming solely for a "Working Certificate" take vital interest in the contest activities; third, parents visit the schools in connection with the school fairs; fourth, boys and girls have been given an opportunity to express themselves; lastly, the contest work has given inspiration for better school life.

The funds to carry on this work have come from the Business Men's Association of Elmira and from the granges of the county. The granges have given funds to send the contest winners to Cornell for a day during Farmers' Week.

The work of 1913-1914 was, in part, as follows: During April, 1914, illustrated lectures on poultry raising were given at various school centers throughout the county by Mr. Krum from Cornell. At this time definite instruction was also given on potato raising and bread making. To these lectures the public were invited, and in many centers the schools were filled.

Every boy and girl from ten to sixteen years of age, was given an opportunity to enroll in the contest work. Examinations were then given in the three contests, and the papers were marked by the district super-

intendents. The children getting seventy-five per cent or above on their papers, were given a setting of white leghorn eggs, four Rural New-Yorker potatoes, or a bread tin, according to the contest chosen. Each school chose a group leader, on whom fell the responsibility for the summer work, for each member was expected to fill out on a printed report what he was doing each month. These reports were signed by the leader, and sent to the farm bureau, where they were put on file as definite records of each boy's and girl's advancement.

Raising vegetables for the school festival

In October, at various centers, harvest festivals were held, some lasting all day. At this time each contestant who exhibited one pair of white leghorn chickens, one hill of potatoes, or one loaf of bread, and who had sent in reports during the summer, was given a bronze button. Silver buttons were given to the contestants making the best exhibits of poultry, potatoes, or bread at each festival. Gold buttons were awarded to the contestants making the best exhibit in each supervisory district. Finally gold star buttons were given to the three contestants making the best exhibits of poultry, potatoes, and bread in the entire county.

To the contestants who made out some of their reports, and also made exhibits, blue ribbons were awarded. Besides making exhibits of the three things mentioned, the children were encouraged to bring other vegetables raised by themselves, other baked stuffs, and sewing, to the festivals. Numerous pets were put on exhibition. To all these children red ribbons were awarded.

In the county the total number enrolled in contest work was 1049, of whom 527 exhibited the results of their labors.

EXTRACTS FROM A LETTER

February 1, 1915

Early last spring I held a conference with the masters of the several granges in this supervisory district and with the farm bureau agent, W. L. Markham, to talk over and arrange tentative plans for agricultural contest work among the boys and girls in the district. We concluded to promote a peck-potato-growing contest and selected the plan as out-

lined in the Cornell Rural School Leaflet on agricultural contests. The master of each grange pledged himself to provide fifteen dollars as a first prize to the boy or the girl who would grow the best peck of potatoes in compliance with the rules and regulations, such money to be used to defray the expenses of the contestant to Farmers' Week at Ithaca.

Nineteen boys entered the contest; seventeen continued to the end. One was disqualified for good reasons, and one had his potatoes washed from the ground by a heavy fall of rain.

During the growing period of the potatoes, Farm Bureau Agent Markham and myself visited the several contestants, went with them to their plots, and discussed the subject of potato growing in general.

On October 30, at East Aurora High School, teachers, pupils, and patrons of the several schools of this district assembled with the contestants

At work in his potato patch. This lad was successful in the competition in the Third Supervisory District, Erie County

to participate in the exercises held in connection with the exhibit of the potatoes grown by the seventeen boys. The potatoes were judged by Mr. E. V. Hardenburg of Cornell University, and five prize awards were made as follows:

Under the jurisdiction of the East Aurora Grange, Glenn Foss of District No. 1, Aurora, was awarded first prize; under the jurisdiction of the South Wales Grange, Harry Adams of District No. 8, Aurora, was awarded first prize; under the jurisdiction of the Griffins Mills Grange, Harold Grover of District No. 5, Aurora, was awarded first prize; and

under the jurisdiction of the Marilla Grange, William Foster of District No. 1, Elma, was awarded first prize. The grand prize, special, was awarded to Edward Jerge, District No. 6, Marilla.

There were present at the exercises, Mr. W. L. Markham and Miss Katherine H. Mills, of the Erie County Farm Bureau, and Miss Claribel Nye and Mr. Edward M. Tuttle, of Cornell University. Mr. Tuttle will be glad, I am sure, to testify to the general enthusiasm of those present. We were considerably handicapped by the inclement weather.

Under the direction of Miss Katherine Mills of the farm bureau, two bread-making contests have been held in Districts No. 2 and No. 8, Aurora. One of the girls in the contest held at South Wales (District No. 8, Aurora) was awarded a prize of $15 to defray her expenses while in attendance at Farmers' Week, Ithaca, this month. The bread baked by the South Wales girls was exhibited in connection with the potato exhibit held at East Aurora on the thirtieth of October.

Sincerely yours,

W. E. PIERCE,

Superintendent of Third District, Erie County

SCHOOL FAIRS

May Firman

(Superintendent of Fourth District, Otsego County)

Wishing to increase the interest of parents and of the general public in the schools, and at the same time to stimulate in the minds of the pupils a love of nature and an interest in their home work, I decided last year to hold a school fair in each of the four towns in my supervisory district.

During the summer vacation of from two to four months, varying in length in the different districts, the boys and girls usually spend their time in an aimless sort of way; the time often hangs heavily on their hands. Even when pupils spend the greater part of the vacation period in work, on the farm or elsewhere, the work is done in a way that develops little or no thought or interest in the thing that is being done.

Of the animal life and the plant life that abound in the open country, of the farm sciences of cultivation and animal husbandry, of the home sciences of sewing and cooking, pupils learn next to nothing during the vacation. Consequently they return to school in the fall with little, if any, more mental power, and with even less information than they possessed when the vacation began.

As a means of remedying this condition, I determined to have contest exhibits at our fairs, which would require advance preparation, and would

keep the boys and the girls employed at useful and interesting tasks for at least a part of the time when the schools were closed.

In Otsego County, we were fortunate in having a farm bureau. In each town I presented my plans to the farm bureau committeemen,

Rural school fair, Fourth Supervisory District, Otsego County

whom I found very ready to cooperate with me, and who appointed a committee of their members to have charge of the agricultural and the poultry contests, and who solicited the prizes to be offered. A teacher was appointed chairman of a committee that had charge of the other contests, and this committee appointed subcommittees to look after special contests that were arranged.

The prizes for the various contests were obtained in different ways. In some towns the prizes were offered by individuals for whom the contests were named. For example, in the town of Milford, the prize for the potato contest was given by Supervisor Charles Armstrong, and in the list of contests it was called the Supervisor Armstrong Potato Contest. In some of the towns the money for the prizes was solicited by the teachers. After the contests had been decided on and the prizes had been offered, announcements were made in a local paper in each of the four towns.

The fairs were held during the latter part of September, and the contests were open to all pupils who had attended school in the town during the previous year, or who had enrolled for the fall term.

In each town there were special agricultural contests, the potato contest being the most important one. The conditions required that the potatoes

should be planted by the tuber-unit method. The winner of the first prize in each town was entitled to compete for a county prize offered by the Farm Bureau Agent, Mr. Floyd Barlow. Gilbert Cummings of Milford won the county prize.

There were, also, contests in bread making, in cake making, in sewing, and in darning. A prize was offered for the best bouquet of cultivated flowers. Another was offered for the best collection of specimens of native woods. The scholastic contests included work in reading, in multiplication, and in drawing.

School float, prepared by District 7, Town of Oneonta, Otsego County

A school parade was a very important feature of each fair. Nearly all the districts were represented by school floats some of which were elaborately decorated, while the float of one small rural district was a child's express wagon well decorated and drawn by faithful dog Tray. Each float had a banner, which gave the name of the school. In more than one town, the parade was declared to have been more spectacular and pleasing than any pageant ever presented there.

Various athletic contests, in which old and young participated, were held at each fair and were heartily enjoyed by all.

Mr. Edward M. Tuttle, of the State College of Agriculture, was present and made an address at each of the four fairs, which added much to the interest in the boys' and girls' leaflets.

It requires a great deal of time and effort on the part of a district superintendent to conduct school fairs; but I know of nothing that creates more interest in the schools on the part of the public in general, or that does so much to arouse the interest of the pupils in things that are real, useful, and practical.

Parade of floats. School fair, Oneonta Plains, New York

District 1, Town of Milford, Otsego County
Milford, New York, April 14, 1915

Dear Mr. Tuttle:

I first became interested in the potato contest last spring soon after I noticed in the papers that there was to be a contest. I decided to enter and see what I could do raising potatoes. I thought I would stand as good a chance of winning the prize as any one because I had always lived on a farm, had always taken an interest in farm work, and was familiar with it.

The place where I decided to plant my potatoes was near a small stream. The ground was of rather a dark color. I planted Green Mountain potatoes. I used twenty-five potatoes, cutting each potato into four parts. I manured the ground, and after that I put phosphate in each hill. After my potatoes came out of the ground I hoed them; and soon after that I put ashes around among the stalks and hoed them again. As soon as the potato bugs appeared, I put on paris green, and I did this by mixing the paris green with plaster. This mixture consisted of one pound of paris green to eighty pounds of plaster. After that I didn't have any trouble with potato bugs.

Two or three days before our school festival, which comes the latter part of September, I dug my potatoes. I kept a record of the potatoes

which had come from each potato that I had planted to see which was the poorest unit and which the best. After that I weighed all of the potatoes and put them away where they might be seen by any one who might be interested. All of these potatoes weighed five hundred and seventy-one pounds. I picked out ten of the smoothest, nicest looking potatoes and entered them at our school festival. Four of them weighed nearly two

Gilbert Cummings and the thoroughbred Holstein bull calf that he won at the fair at Morris, New York

pounds and a quarter. At our fair I received first prize — five dollars. By getting a first prize here I was encouraged to enter the county contest at the Morris, New York, fair. The Otsego County Farm Bureau had offered a Holstein bull calf as the first prize at this fair. There were about one hundred and twenty-five entries at the Morris fair, but I was fortunate to win the bull calf.

I think the school fair, or festival as we have called it, is a good thing because it gets children interested in seeing what they can do to produce something themselves. Even though all cannot win the first prize, more is produced than if no effort is made. The township school fair brings the children of the different districts of the township together in healthy competition. The Morris fair is the last fair of the year in Otsego County and it is just late enough to receive the best entries of farm products. It comes about the first of October. Here all the school children who had won prizes in the different towns of the county made their entries; and in addition to these there were many other entries of potatoes and other farm products. An agricultural fair of this kind is of value to those interested in agriculture, because here the farmer can see what other farmers are raising.

The calf which I won is nearly white. He is a thorough-bred, registered

Holstein. He has wintered well. He is a little over six months old now and he weighs three hundred and fifty pounds.

Sincerely,

GILBERT CUMMINGS

Editors' note.— Gilbert Cummings lives on a farm. At the time of writing this letter he was sixteen years old, and in his second year in the Milford High School.

CHILDREN'S LETTERS

EDWARD M. TUTTLE

Letter writing is an important part of a child's education. It is easier to encourage children in their efforts when they know that their letters will be sent through the mail to some one who is interested to receive and read what they have written.

The editors of the Cornell Rural School Leaflet have always felt the desirability of establishing as personal a relationship as possible with the schools. It is of advantage to both sides. The children come to have a better understanding of the State College of Agriculture and an acquaintance with the specialists in many of the different branches of natural history, agriculture, and home making. They gain an interest outside of themselves, and an outlet for their thoughts. The correspondence has a value, also, to the teacher, which was well expressed in a letter received last spring from a teacher in Highland. She said, " I am glad to have access to my children's letters to you. I do not have them corrected or rewritten, for I fear to spoil their freedom and joy in talking to you. They need no urging to do their original best. I glean from their letters things I would never know except that their self-expression gives vent because of their belief in you." The editors, on the other hand, profit greatly by the touch with the children, for it keeps them acquainted with local conditions and the outlook that boys and girls have to the things around them.

The correspondence must, of necessity, be somewhat one-sided, but it need not lose interest thereby. Each number of the leaflet for boys and girls contains a signed letter addressed to all readers. It is the object in writing these letters to make each child look on them as personal messages. The children are encouraged to reply, addressing their letters to Edward M. Tuttle, College of Agriculture, Ithaca, New York. The letters may be written in school or out of school, they may be long or short, and may treat of anything in which the child is interested. More and more the letters received at the College present an individuality that is gratifying. The ideal toward which to strive is that the letters shall be the spontaneous expressions of the writers.

The letters from boys and girls are not read critically; they are read sympathetically. Ideas have more weight than the method of expression, although quality in the latter is recognized and appreciated. No judgment is passed on the teacher because of the nature of the letters from the children. Interest is the keynote, with educational progress as a background.

It is impossible, of course, to answer personally every letter that is received at the College. The general answers are contained in the letters in the leaflets. Each year, however, several thousand personal letters are written, whenever the children have asked intelligent questions that warrant an answer, whenever some praiseworthy piece of work is described, and whenever the general interest is marked. Naturally the oftener a child writes, the more likely he is to receive a direct reply. In all cases, however, when a boy or a girl has received credit for three letters between September 1 of one year and September 1 of the following year, a small gift picture is sent as a reward of merit. To receive credit a letter must contain at the top, the school district number, the name of the township, and the name of the county. (See specimen letters that follow.)

During the year a dozen or so selected letters are published in the leaflet, with editorial comment. Effort is made to select letters that contain suggestions of interest and value to all boys and girls. Teachers can do much to maintain the children's interest in the letter writing, and to help them to feel the personal friendship that the editors of the leaflet extend to them. Several typical letters follow:

District 6, Town of Otsego, Otsego County
Cooperstown, New York, April 30, 1915

Dear Mr. Tuttle:

I am eleven years old. As I have read several of the other letters that have been written to you, I thought I would write and tell you about our school float that we had at the county fair last fall.

There were five floats that entered and we took the first premium. The trustees supplied us with a large wagon, and a team of pretty black horses. In front of the wagon we had a tree loaded with beautiful red apples, and at the back of the wagon another tree with a few small worm-eaten apples on it and a tent caterpillar's nest in the top. The largest boy in school stood under the front tree spraying it. In the center of the wagon was a large umbrella covered with flowers and ribbon. All the school children, dressed in white and carrying bouquets of flowers that they had raised, sat under the umbrella. The wagon was draped in white and green. We have a large picture of it framed and hanging in the schoolhouse.

We intend to try something again this year.

Yours sincerely,

BERNICE E. WRIGHT

The school float prepared by District 6, Town of Otsego, Otsego County

District 12, Town of Galen, Wayne County

Clyde, New York, April 23, 1915

Dear Mr. Tuttle:

We received the leaflets and have read them almost through.

We had Bird Day but did not go to the woods because it was so cold. We studied the birds and pinned the pictures of birds upon the wall. We waited until another day when it was warm to go to the woods. We had a nice time. We started at half past twelve, as the woods we went to was quite a ways from the schoolhouse. We went in groups of four, but the teacher took the little children with her. We had to be very quiet so we could see the birds. We all had little account books and pencils so we could write down the different kinds of birds we saw. About three o'clock we all sat down on a log and counted up the things we had seen. We found that all the school together had seen twenty-three kinds of birds, eleven kinds of trees and nine kinds of flowers.

Sincerely yours,

MILDRED E. MATTHEWS

District 2, Town of Pittsford, Monroe County

Pittsford, New York, February 18, 1915

Dear Mr. Tuttle:

Our teacher has been receiving some of the little leaflets which you have sent. She has given them to the pupils. I enjoyed reading the letters, and about the poultry, so I thought I would write and tell you about my hens. Two years ago my father bought me twenty single comb brown leghorns, but I did not like them. In the spring I bought an incubator,

and also one hundred barred rock eggs. I had good luck with them. I bought a brooder, and the chicks grew good, and in the fall I kept the best pullets and sold the cockerels and other pullets. My henhouse is in the basement. It is dry and warm. The pullets layed good. In March, 1913, I bought eight white orpington hens, and a cockerel. Last summer I hatched thirty white orpingtons and eighty barred rock pullets. This winter I took the orpingtons to the Tower City show, and won several prizes. I won good at Pittsford, and at the Rochester exposition. I keep clean litter on the floor, which is cement, and clean out the henhouse every two weeks, and put in clean wheat straw. I spray my henhouse once a week, and clean the dropping boards every morning. My nests are under the dropping boards. I keep clean straw in them. In the morning I feed a scratch feed made of sixty pounds of cracked corn, sixty pounds of wheat, and thirty pounds of oats. I feed this at night, too. I have a mash which I keep in hoppers all the time, composed of bran, middlings, gluten meal, pea meal, fish scraps, oat meal, low-grade wheat flour, and corn meal, and ground alfalfa meal. I feed green bone at noon every other day, but not enough to force them. I hang cabbage in the pen every day. I keep grit, oyster shells, and charcoal in hoppers. I give them fresh warm water twice a day, in a water fountain which I won at the show. This month I bought a two hundred and fifty egg incubator, which cost thirty dollars, and from September I have made a profit of eight dollars and twenty-nine cents, and the incubator, feed, and everything paid for.

I now have sixty-three barred rocks and thirty white orpingtons; all are pullets, except seven hens which are white orpingtons. The first of February I got thirty-two eggs, thirteen being orpingtons. I am thirteen years old.

Respectfully yours,

EDWIN BLODGETT

District 4, Town of Pharsalia, Chenango County

East Pharsalia, New York, February 23, 1915

Dear Mr. Tuttle:

I am going to write you a letter telling you how I enjoyed Farmers' Week. Do you remember a little girl with a red hat and a green coat? I had a good time. I saw the rural school exhibit. Our school sent a bird's nest mount, and an ear of corn. I saw them. I wish I had gone with you and the children in the afternoon. My mother is a school-teacher. I was never to Cornell before. I went with her this year. I want to thank you for the good time you gave me that day.

I have received the January leaflet and we are reading in it for a reading lesson.

We have a thermometer in the schoolhouse and we try not to let it get over 68° F. Our stove is a large round oak. It has no metal jacket.

I am gathering tent caterpillar egg clusters. I have got 862 now, but I am going to get some more.

We have an organ but it is not a very good one, but it is better than none. We sing two or three songs every morning; we are learning three songs so when you come to our school we can sing them.

Your little friend,

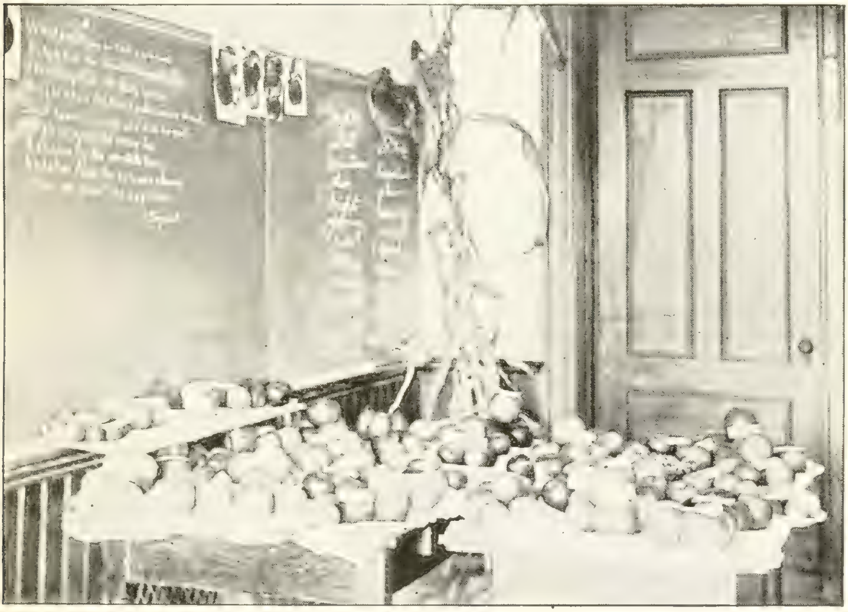
HAZEL LUCY THOMPSON

District 1, Town of Wilson, Niagara County

Wilson, New York, September 6, 1914

My dear Mr. Tuttle:

Our teacher, Mrs. Martin, received your letter in answer to the picture of the apple exhibit, and I was the one selected to write you a letter.



The apple exhibit in District 1, Town of Wilson, Niagara County

We had forty-five varieties of apples and about forty visitors besides the pupils of the other departments. We had many new varieties which are not common around here, and also some potatoes and Niagara grapes. Each pupil brought a different variety of apple, and some we had three of a kind, and others, five.

We have also taken up in agriculture, the codling moth and other insects, trees, birds, and the corn plant which you see in the picture.

We went to the woods one afternoon, and there found many interesting things to study. We are now taking up the maple trees, and expect to watch the buds through the winter. I remain

Your friend,

ESTHER JOHNSON

WHAT SOME TEACHERS ARE DOING

Editors' note.— Teachers are always interested in what their colleagues are doing in situations resembling their own. From a large number of reports that have come to the College several illustrating different phases of work relating to natural history, agriculture, home making, and the general development of rural schools, have been selected. These will be found on the following pages.

Newfane, New York, June 15, 1915

The boys and girls of District No. 10, Town of Newfane, Niagara County wish me to extend their thanks for the book recently received, and for returning to us the notebook, which was considered worthy of first prize.

We found so much pleasure and learned so many things about horses while preparing our notebook that we thought that sufficient reward for our work. Last year we received three blue ribbons and a book for our Farmers' Week exhibits, but serious illness in my home made it impossible for me to get anything in shape for it this year. This was a disappointment to us all, for we wanted to do all we could to show our appreciation for the many things you have done for us.

When we found in the leaflet about the horse notebooks, we thought that was our chance; but the result was far above our expectations. One of the men of our district asked to see your letter, and a few days later it appeared in our local paper. It has aroused much interest, and I am questioned about it from all sides.

I hope that more of our teachers will take a greater interest in the out-of-doors. So many think it takes too much time, but if they would only try it out, they would find it a timesaver. School work goes so much better after a few minutes spent in observing some living, growing thing.

Fort Edward, New York, February 1, 1915

All are very much interested in the improvement of our school and grounds, and I think when spring comes we will act on your suggestion in regard to the planting of some shrubs, and we also wish to get the ground in shape and seed it.

There is certainly room for much improvement, but I wish I might send you a photograph of the building as it was at the beginning of school last fall. The foundation had fallen away leaving the building resting in the mud on one side. Many of the clapboards were loose. On the inside the floor in many places was worn through, an old jackknife-carved bench extended all the way around the room, which was ceiled up with wide, rough boards. The windows were small (having seven by nine glass in some places, and in others none), and they were so high that when a person was seated it was impossible to see anything outside except the sky. Even the yard outside was untenable, being filled with poison ivy. Our district superintendent, I believe, condemned the school, and for a time it was almost decided to abandon it and unite with an adjoining district. But this did not meet with favor with those having little folk to go, as the distance was considerable. So during a two-weeks vacation

last fall our trustee, with the help of some of the other people of the district, undertook to improve conditions. First the yard was plowed, and the ivy disposed of. Then the building was raised and placed on a concrete foundation with a cement doorstep. The windows were then removed, cut down lower, and replaced by new casings and sash; after which the clapboards were removed and replaced, after lining with building paper.

The old benches were removed, the room was lined with Georgia pine ceiling, and a new floor laid, so that, after new doors were hung, the room was snug and warm. Our windows are provided with stops so that we may have good ventilation all the time, and we hope to have the " new stove " a little later.

Next spring we are going to have a coat of paint outside and in, and some new curtains. The boys and girls are very enthusiastic in the work and take much pride in the improvement of our school. They are also learning to enjoy the great out-of-doors, and find the leaflets very interesting.

I am sending you the letters which some of them have written, and if you knew the effort they have made to write them all alone, I know that you would be pleased.

I have found the teachers' leaflet very helpful, and I believe that the study of nature is a great factor in the building of character, as well as clear minds and strong, clean bodies, and those are the things which count.

Newfield, New York, November 28, 1914

I have intended to write you before this, and tell you about our fair. Early last spring my pupils (twenty) determined to have a garden on a small plot of ground for their own, on which they might plant anything they desired.

We read the leaflets thoughtfully and discussed many points. Nothing more was said about what they were to do. On October 23, being Convocation Day at Albany, I requested each pupil to bring the best specimens of the things he had planted and cared for. I told them I would give two prizes — one of fifteen cents and one of ten cents for the first and second best exhibit or exhibits.

Could you have seen their faces you would have had no difficulty in detecting the strife that was sure to follow. As we had never had a parent-teacher meeting, each pupil was requested to invite his parents. Well, Friday morning came, and on looking out of the window, I saw wheelbarrows, baskets, pails, pans, and one mother with a horse and small wagon — all loaded with products. The children had the privilege of bringing any animal that belonged to them. Friday morning at ten-thirty our schoolroom was a pleasing picture. Bouquets of salvias, chrysanthemums, asters, sweet peas, geraniums, and asparagus were in profusion.

In one corner stood corn over eleven feet tall, and on each end of the platform rested two huge pumpkins. The pumpkins came from my home. They were the largest ever grown in our neighborhood. On entering I heard one lady say, " What a restful place! " After the judging, selections were read, poems recited, and I had one recitation in number work by my third-grade pupils.

My part now being over, I had time to speak of anything that the parents wished to mention. During the few moments we were engaged, the four largest girls and two of the largest boys made ready the refreshments.

I am sure every parent present enjoyed every moment hugely. And, as for me, I have never spent that amount of time and money and received the pleasure and satisfaction that I did on that afternoon. The children talked about it for several days thereafter.

Lynnbrook, New York, January 13, 1915

I am sending under separate cover an exhibit of hen feathers for the Farmers' Week display. It was the best of twenty my children made. * * * * *

I teach the seventh grade in a suburban school. About one-half of my pupils have recently come from the city and never heard of nature study, the other half are the natives who began by scoffing at the fad. The outlook was not inspiring, but the results have been very gratifying.

We began in the fall by a study of seed dispersal, including the habits of the commonest weeds. Then in the weeks when the woods were most glorious, we made leaf scrapbooks. Some of the drawings the children made in the fall with crayons are very good.

Next, we turned our attention to cattle. I made four mounts, labeling them with the names of the breeds commonest about here, and the children filled them with pictures, clippings, photographs, and remarks. We visited the only dairy farm of any size around here, and learned a great deal. The board has since allowed me to buy a Babcock tester, which we shall use as soon as the examinations are over.

When I mentioned the poultry outlines, their enthusiasm was boundless. One boy brought his pet bantam rooster to school for an afternoon, and we had a splendid lesson. Two boys made mounts of turkey feathers, and one of pigeon feathers. We had a little competition of our own to decide which was the most worthy of being sent to you.

We made such an interesting collection of insects' homes — a hornet's nest, the nest of a polistes wasp, a mud dauber's nest with the paralyzed spiders in it, and a mason wasp's nest containing the grubs and remains of caterpillars.

Glens Falls, New York, April 22, 1914

Until I came here, three years ago, nature study and agriculture had been taught only one year, and were therefore comparatively new, both to the pupils and to myself, as I have been teaching but a short time, so we have worked together. The first thing I attempted was to arouse the interest of the children. One way, which worked out very successfully, was to assign to each child a certain number of points to observe on whatever we might be studying, whether bird, animal, tree, plant, or insect. These he was to observe carefully with the aid of his parents, thus bringing the parents into touch with us. The interest this aroused was astonishing. We made the recitation period more of a visiting period, and each child was most anxious to tell all he or she had learned. If more than one had been given the same points, and disagreed on the result of their

observations, as they often did, it was amusing to see how anxious they were to make the second observation, as I never put them right when they might find out for themselves, as the fact was more firmly fixed in their minds when placed there through their own efforts.

For those things that we are unable to learn from observation, we use the Cornell Rural School Leaflet, and books from a very fine library which we have.

Each year we take the plant that is given for special study, and start it from the seed, watching it in its different stages of growth, the older pupils keeping notes on it. One year we got some frog's eggs, placed them in a glass fruit can, and watched them hatch and develop. We have tamed several squirrels so they will come and eat on the doorstep, giving the children an excellent chance to watch them. Many birds, such as winter birds and birds of early spring, have become very friendly by being fed and treated kindly by us, giving us opportunity to study them closely. And with the books on birds that I have with colored cuts and descriptions, it is remarkable how many of these little creatures we have become acquainted with in so short a time. The boys have made a very nice bird house, which they hope will be used this summer.

In studying plants and weeds I connect this work with drawing, thus fixing more clearly in the children's minds the joining of leaf to stem, leaf forms, seed pods, and the like. I also bring specimens of different grasses, grains, and weeds to the school. * * * * *

In poultry interest is shown also. The henhouses have been cleaned, nests improved, fowls fed regularly with proper kind of food and water for each meal according to season. Good results have already been obtained, which, of course, are very gratifying to all of us.

Binghamton, New York, April 8, 1914

On the east side of our schoolhouse there is a lot in which young fruit trees, apple and pear, are growing. The owner of the lot, a florist and gardener of Binghamton, New York, sent his son down to spray the trees last Arbor Day. I immediately went out into the lot and asked him if he had any objections to my bringing my pupils over there to watch him spray the trees. He said, "No," and then he stopped and showed us how the hand pump worked, told us what solution he was using — the bordeaux mixture — how it was made, how many times he used it, and what for. He told me he was a graduate of the Cornell College of Agriculture, so feeling sure that his information was correct, I had the sixth and seventh grades write it down in their notebooks when we returned to the schoolroom.

On the west side of the schoolhouse there is a large field which was planted to corn last year. Every morning recess and noon we watched the plowing, harrowing and planting, noticed how long it was after the seed was planted before the corn peeped above the ground, its growth during the summer, and its harvesting for ensilage in the fall.

I didn't tell the children that they must watch that cornfield. Not at all. I simply said that I enjoyed seeing the work and was going to watch it. Of course, the children wanted to do just as their teacher did, so we all watched it. I asked the older boys a good many questions, and

they were delighted to tell me things about raising corn, as a number of them were raising some at home. Pope says, " You must teach men as if you taught them not," and, as the boy is father to the man, it works very well on boys also. * * * * *

There are nineteen large maple trees in the school yard where I teach. These trees are very large, and some of them have been growing nearly forty years. It is needless for me to say that plants or shrubs will not grow in that yard. The children in former years have tried having flowers and plants, but were not successful. Now I do not encourage planting a tree or shrubbery in our yard on Arbor Day, and I explain to them that the large roots take all the moisture and nourishment from the soil and the foliage the sunlight, but that our beautiful maples more than compensate for that, and that the survival of the fittest is best here as elsewhere.

Sandy Creek, New York, April 16, 1914

We try to study, as far as possible, the real not the printed things. For instance, we are taking up the study of poultry. We selected one person in the district who has the best conditions for making the poultry business a successful one. To that farmer's home we went in a body, during a noon intermission, each pupil taking notes on facts that he or she was to obtain. (These had been previously planned out and listed.) Some of them were care, food, water, description of the henhouse including size, lighting, ventilation, and inside conveniences for the hens. We also collected specimens of the different kinds of feed. At the end of this trip we knew more about the care of hens than three weeks of patient studying would have given us. We intend to study cattle in the same way. * * * *

Our trips about the district prove to the skeptical that we are doing something worth while. Our appliance of nature study to practical things of life, such as the identification of forest trees and shrubs and the identification of birds and birds' nests, teaches us to love and respect those things of God's creation as well as those of man's.

Our plans for the coming weeks are as full of interest as those of the past. We are planning to form an Audubon Club, which we think will be of great help in our bird study. We are trying to do our own work so neatly that we can enter it at the school exhibit at our county fair, and, perhaps, gain some prize. One of our best plans is to have a good garden. Each year we have had a small one on the school ground, and, though it has been satisfactory as far as it went, we think we can do better. We have rented a plot of land forty feet long and fifteen feet wide, from a farmer whose house is near-by.

In order to transact our business properly we have formed a board of managers. This consists of a president, a vice-president, a secretary, a treasurer, a business manager, and a collector. In the treasurer's hands I have placed four dollars to defray all necessary expenses. From this sum the business manager will draw enough, at different times, to pay rent, cost of seeds and fertilizers, and for incidentals.

As our vegetables mature we are planning to sell them to the occupants of the cottages, and to the hotels at a summer resort close by, and to the grocers of our nearest village as they pass on their delivery trips. The

proceeds from this garden, after repaying the four dollars, will go to purchase something for the schoolroom, possibly a nice picture.

Each member of the board plans to keep a record book and in this a strict account of all business pertaining to his or her office. The books are of uniform size, made by the pupil, and decorated with different designs. In this way I am planning to correlate manual training, drawing, arithmetic, English, spelling, banking, bookkeeping, and honesty. We are sure that our garden will be a success, and later will be glad to send you some pictures and accounts of real results obtained.

Nature study, thoroughly understood and happily applied, keeps the school machinery running smoothly, and, when night comes on, causes pupil and teacher to think that that day was not lived in vain.

Editors' note.— The following communication from the teacher was published in the *East Aurora Advertiser* of May 27, 1915, under the heading " Home Economics in District No. 7, Hamburg ":

We began our work in home economics in the autumn soon after school opened. Interest among the children was awakened by a bread contest conducted under the direction of the district superintendent with the cooperation of the Home Economics Department of the Erie County Farm Bureau. It was decided to hold the contest as a part of our program for Corn Day. The exercises were well attended by patrons of the school and at the close of the program a few words explained to the parents the nature of the work which we wished the children to take up.

In the basement of the schoolhouse the trustee has built a stationary cupboard and put in a two-burner hot plate. This is so arranged that the cupboard can be closed and locked, thus placing the gas out of reach of the children when playing. Above the shelf on which the hot plate is kept are two large shelves for the cooking dishes. We have an old bookcase with glass doors and a drawer in which we keep the china and towels.

Our class was organized immediately after Corn Day and consisted of twenty-four enthusiastic girls and boys ranging in ages from eight to sixteen years. Each family represented in the class was asked to give twenty-five cents (if this was impossible they might give less) to purchase the necessary dishes. Each child was required to have a notebook, a spoon, a cup, a plate, an apron, and a hand towel and soap. We met every Wednesday afternoon, directly at the close of school.

With the money furnished by the children and a part of our prize money from our school exhibit at the Erie County Fair, we bought the remainder of our equipment: towels, two dish pans, one granite kettle (eight quarts), one granite saucepan (six quarts), one basin, one dipper, one measuring cup, two toasters, one strainer, or sieve, two large spoons, one paring knife. We bought large granite dishes so we might use them for preparing a warm food for lunch at noon as explained later. Soap, matches, holders, and the like, were donated by some of the mothers. We also bought a small washboard which could be used in the dish pan to wash out the towels after using, and each week some child took them home to be washed there.

Our term consisted of twelve lessons, and since we had no oven, the recipes used were those which could be prepared without it. Our aim in choosing the recipes was twofold: (1) to teach economy; (2) to use left-overs in a palatable and practical way. Each Wednesday afternoon the class met in the schoolroom at the close of school, and copied the recipe from the blackboard into notebooks. After the explanation of the recipe we went to the basement where discarded desks were placed so that the class, when seated, could see the hot plate. Then the recipe was demonstrated by one of the teachers, and as there are two of us, each taught the recipe on alternate weeks. Each child was asked to try the recipe at home before the next lesson and if good results were obtained he was given one credit. A credit was allowed for class attendance, another for neat notebook work, making a total of three credits on each recipe possible for each child.

The interest and enthusiasm of the children was keen throughout the term's work and all wish to continue the course next year. At the close of the course, just before

the Easter vacation, members of the class invited their parents to a "spread" one afternoon at the time of the usual lesson. Lunch was prepared and served by members of the class.

Warm lunches.— All except two of the children in the school come a long distance and so carry a lunch. After the class in cooking was well started we began to plan for warm food at noon. Those desiring something warm formed themselves into a "warm-food club" and each family took turns bringing food which could be heated and eaten with the cold lunch. Some of the favorite dishes were cocoa, soup, stew, boiled rice with raisins, and the like. We would choose two older girls to take charge of the lunch, and they appointed two or more helpers. Different children did the work each day and all were willing and eager to do their share. Preparation of the food was begun before school or at recess, and at a quarter to twelve the two girls left the room quietly and finished preparing it.

At noon the children passed to the basements and washed their hands, then taking their lunches, sat at a desk. The girls and their helpers served the cocoa or soup, and when all had been served we ate together like a large family. Most of the time there were forty-five children who had something hot for lunch daily. After lunch the same girls washed the dishes and put them back in the cupboard. Every one enjoyed this lunch, and we continued it until the warm spring days began.

After we were fairly started, we found that there was not a great deal of extra work connected with this plan. Once a week a committee of the children met with me and we planned the menu for a week and appointed those who were to furnish the food and those who were to do the work. Except for the planning and supervision the children did all the work themselves.

I feel that results obtained in union of interest, creating a new bond between the home and school, beside the value of the hot food to the child, were well worth the effort and time required.

THE NATIONAL AUDUBON ASSOCIATION

T. GILBERT PEARSON

Editor's note.— The study of birds is one of the most interesting and valuable in the field of natural history. It is often desirable to organize the boys and girls for bird study, and, inasmuch as the National Association of Audubon Societies is the recognized center of ornithological activity, Mr. T. Gilbert Pearson, secretary of the association, has been asked to prepare the following article outlining the work done by the Audubon societies and particularly dealing with the Junior Audubon classes into which schools may be organized.

The headquarters of the National Association of Audubon Societies is No. 1974 Broadway, New York City.

The National Association of Audubon Societies for the Protection of Wild Birds and Animals is an endowed institution, incorporated under the Laws of New York.

The objects of the association are to arouse in a greater degree the public conscience on the important subject of preserving the wild birds and the game animals of the country, and to secure protection at all times for the valuable non-game bird life.

The activities of the association are directed primarily to the following fields:

1. It cooperates with the state Audubon societies, state agricultural colleges, natural-history organizations, and local, state, and federal

authorities, in promoting the study of birds, the dissemination of knowledge concerning bird life, and the protection and the increase of useful species.

2. It conducts legislative campaigns in the interest of state and federal laws to conserve useful birds and animals.

3. It conducts ornithological surveys, recommends the establishment of bird sanctuaries to state and federal authorities, and aids financially in protecting these reservations.

4. It employs a force of wardens to protect the more important colonies of ducks, geese, gulls, terns, pelicans, and other water birds throughout the United States.

5. It maintains a corps of field agents and lecturers who are constantly bringing to public attention the value of wild birds and animals.

6. It is actively interested in regulating the plumage trade and the suppression of traffic in the feathers of native birds.

Yellow-billed cuckoo. This illustration has been reduced from large four-color illustration of the Audubon Society bird picture

7. It has been largely instrumental in suppressing the systematic trapping of thousands of mocking birds, cardinals, and other native song birds, for sale in North America or for shipment abroad.

8. It is organizing annually more than one hundred thousand school children into classes for the study of birds; and it aids in giving at summer schools courses in bird study most useful to teachers.

9. It publishes and distributes millions of colored pictures of North

American birds, accompanied by leaflets containing a concise account, in popular language, of the latest known facts regarding the feeding habits and the general activities of the birds described.

10. Through the magazine *Bird-Lore* and by correspondence, the home office serves as a clearing house for everything pertaining to methods of attracting and preserving birds.

JUNIOR AUDUBON CLASSES

Special contributions amounting in 1915 to about $25,000 have been subscribed to the association to be used in aiding teachers and pupils during the school year 1915–1916.

Any teacher or other person who will interest not less than ten children in contributing a fee of ten cents each to become junior members, and will send the money to the office of the national association, will receive for each child ten colored pictures of wild birds. With each one of these ten pictures there is an outline drawing intended to be used by the child for filling in the proper colors with crayons. Each picture is also accompanied by a four-page leaflet discussing the habits and the general activities of the bird treated. Every child receives also an Audubon button. The cost of publishing and mailing this material is a little more than twice as much as the child's fee, the excess being defrayed from the contribution of $25,000 already mentioned. During the school year ending June 15, 1915, more than one hundred and fifty thousand children were enrolled in Junior Audubon classes.

The teacher who forms such a class receives, without cost to herself, one full year's subscription to the beautiful illustrated magazine *Bird-Lore*. This is the leading publication in the world for bird study. To the teacher there are sent, also, other free publications containing many hints on methods of putting up bird boxes and of feeding birds in winter, and descriptions of methods of attracting birds.

The accompanying illustration will give some idea of the character of these pictures, which are in natural colors, printed on cards of sufficient size to make attractive schoolroom decorations.

The ten subjects to be supplied to children during the coming year will be passenger pigeon, mourning dove, chickadee, cuckoo, screech owl, tree sparrow, pin-tailed duck, robin, herring gull, and crow.

Endorsing this work, Dr. P. P. Claxton, United States Commissioner of Education, says: "I consider the work of the Junior Audubon classes very important for both educational and economic results, and I congratulate you upon the opportunity of extending it. The bird clause in the Mosaic Law ends with the words 'That it may be well with thee, and that thou mayest prolong thy days.' The principle still holds. I hope

that through your efforts the American people may soon be better informed in regard to our wild birds and their value."

For further information address

T. Gilbert Pearson, Secretary
National Association of Audubon Societies,
1974 Broadway, New York City

THE DISTRIBUTION OF THE CORNELL RURAL SCHOOL LEAFLET

THE EDITORS

As the demand for the Cornell Rural School Leaflet constantly increases and many persons are newly added to the lists each year, it may be well to describe briefly the methods employed in distributing the publication.

The first number of the leaflet for each school year is published in September and is known as the September, or subject-matter, leaflet. It reaches all teachers of elementary grades without individual request on their part. The names of all teachers under rural supervision are obtained at the earliest possible date from the district superintendents, and a copy of the September leaflet is sent directly to each teacher. Grade teachers in cities and villages having a superintendent of schools receive the leaflet from their superintendent, to whom copies are sent in bulk for distribution.

Every teacher in New York State below the high school is entitled to a copy of the September leaflet. In the case of teachers under city or village supervision, this in the only leaflet available to them during the year. In the case of teachers under rural supervision, additional copies of the Cornell Rural School Leaflet are available. They may be obtained as follows:

Accompanying the September teachers' leaflet will be found a blank form for the names of pupils. This blank should be filled out immediately and returned to Miss Alice G. McCloskey, College of Agriculture, Ithaca, New York. The pupils' names will then be placed on file, and each teacher will be sent a sufficient number of copies of the leaflets for boys and girls to supply the school. The editors hope to send three leaflets for children — one in November, one in January, and one in March. These are distributed to the pupils by the teacher.

To summarize: In order to perfect the method of distribution, teachers in elementary schools under rural supervision should remember the following:

1. A copy of the September number of the Cornell Rural School Leaflet for teachers will be received through the mail early in the school year.

2. A blank accompanies the teachers' leaflet, which is to be used only

by teachers of elementary grades under the supervision of district superintendents of rural schools (page 1437).

3. The blank should be carefully filled out with name and address, district number, township, county, name of district superintendent, and names of pupils.

4. The blank should be returned at once to Miss Alice G. McCloskey, College of Agriculture, Ithaca, New York.

5. Three times during the year a package of children's leaflets will be received through the mails.

6. These leaflets should be distributed to the pupils whose names were on the list sent.

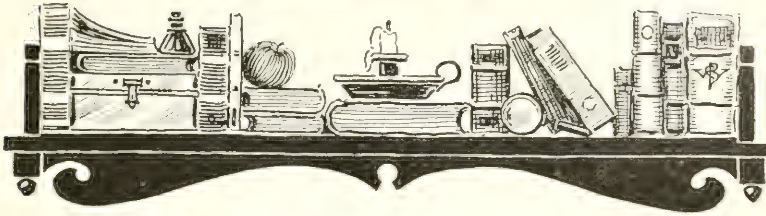
7. Any changes of teacher or pupils in the school should be reported in detail at once, in order that the records at the College of Agriculture may be complete and accurate, thus enabling prompt, correct, and effective distribution of the Cornell Rural School Leaflet.

DISTRIBUTION IN 1914–1915

It may be of interest to teachers and others to examine the following report of the distribution of the Cornell Rural School Leaflet last year:

Persons receiving leaflets	
Rural teachers	14,409
City and village teachers	27,105
Training-class pupils	1,522
Training- and normal-school pupils	791
Pupils in rural schools	183,533
Total	227,360
Number of copies distributed	
Total rural teachers (one number)	14,409
9793 teachers who returned lists of pupils (three additional numbers)	29,379
City and village teachers (one number)	27,105
Training classes (four numbers)	6,088
Training and normal schools (one number)	791
Pupils, 183,533 (three numbers)	550,599
Total	628,371

REFERENCE BOOKS



The publications listed below range in price from sums of less than \$1 to as much as \$4. Prices can be obtained on application to the publishers.

1. Nature Study and Elementary Agriculture

Nature-study leaflets (bound volume). College of Agriculture, Ithaca, New York

The nature-study idea. Bailey. The Macmillan Company, New York

Nature-study and life. Hodge. Ginn & Co., Boston

Handbook of nature-study. Comstock. Comstock Publishing Company, Ithaca, New York

Elements of agriculture. Warren. The Macmillan Company, New York

Agriculture for beginners. Burkett, Stevens, and Hill. Ginn & Co., Boston

Beginnings in agriculture. Mann. The Macmillan Company, New York

New elementary agriculture. Bessey and others. University Publishing Company, Lincoln, Nebraska

Essentials of agriculture. Waters. Ginn & Co., Boston

The great world's farm. Gaye. The Macmillan Company, New York

Sharp eyes. Gibson. Harper & Bros., New York

Eye Spy. Gibson. Harper & Bros., New York

2. Home Making

Textiles. Woolman and McGowan. The Macmillan Company, New York

A sewing course. Mary Schenck Woolman. Frederick A. Fernald, Washington, D. C.

Food products. Henry C. Sherman. The Macmillan Company, New York

Foods and household management. Kinne and Cooley. The Macmillan Company, New York. 1914

3. Plant Life

Plants and their uses. Sargent. Henry Holt & Company, New York

Principles of botany. Bergen and Davis. Ginn & Co., Boston

Manual of botany. Gray. American Book Company, New York

Our native trees. Keeler. Charles Scribner's Sons, New York

Our northern shrubs. Keeler. Charles Scribner's Sons, New York

Trees of northern United States. Apgar. American Book Company, New York

A first book of forestry. Roth. Ginn & Co., Boston
Manual of gardening. Bailey. The Macmillan Company, New York
Garden-making. Bailey. The Macmillan Company, New York
Cereals in America. Hunt. Orange Judd Company, New York
Corn plants. Sargent. Houghton Mifflin Co., New York
Field crops. Wilson and Warburton. The Webb Publishing Co., St. Paul, Minnesota
Textbook of grasses. Hitchcock. The Macmillan Company, New York
Field book of American wild flowers. Mathews. G. P. Putnam's Sons, New York
A manual of weeds. Georgia. The Macmillan Company, New York
Our ferns in their haunts. Clute. Frederick A. Stokes & Co., New York
Mosses with a hand lens. Grout. O. T. Louis Company, New York
Mushrooms. Atkinson. Henry Holt & Co., New York

4. Animal Life

Handbook of birds of eastern North America. Chapman. D. Appleton & Co., New York
Bird guide. Reed. Doubleday, Page & Co., New York
Bird homes. Dugmore. Doubleday, Page & Co., New York
Manual of the vertebrates. Jordan. A. C. McClurg & Co., New York
American animals. Stone and Cram. Doubleday, Page & Co., New York
American food and game fishes. Jordan and Everman. Doubleday, Page & Co., New York
The reptile book. Ditmar. Doubleday, Page & Co., New York
Beginnings in animal husbandry. Plumb. The Webb Publishing Co., St. Paul, Minnesota
Feeds and feeding. Henry. W. A. Henry, Madison, Wisconsin
Milk and its products. Wing. The Macmillan Company, New York
The horse. Roberts. The Macmillan Company, New York
Insect life. Comstock. D. Appleton & Co., New York
Moths and butterflies. Dickerson. Ginn & Co., Boston
The spider book. Comstock. Doubleday, Page & Co., New York

5. Earth Science and Astronomy

New physical geography. Tarr. The Macmillan Company, New York
Soils. King. The Macmillan Company, New York
The children's book of stars. Mitton. The Macmillan Company, New York

6. Nature Poetry

A child's garden of verses. Stevenson. Charles Scribner's Sons, New York
Songs of nature. Edited by John Burroughs. McClure, Phillips & Co., New York

INDEX

IMPORTANT NOTICE

READ CAREFULLY ARTICLE ON PAGE 1431

Two or three leaflets for boys and girls will be sent during the year to elementary schools under rural supervision. There are not sufficient funds to send children's leaflets to city schools.

Your boys and girls should have the leaflets. Please write their names and the other information called for on this sheet and send it to (Miss) Alice G. McCloskey
College of Agriculture
Ithaca, New York

How many books dealing with natural history, agriculture, and home making are there in the school library? ....

What playground equipment is there at the school? ....

How is drinking water kept at the school, and from what do the children drink? ....

Teacher's name ....

Post-office address ....

Number of school district ....

Name of township ....

Name of county ....

Name of district superintendent ....

Number of teachers in the school ....

Number of pupils in your charge ....

NAMES OF PUPILS

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The Cornell Reading-Courses

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NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

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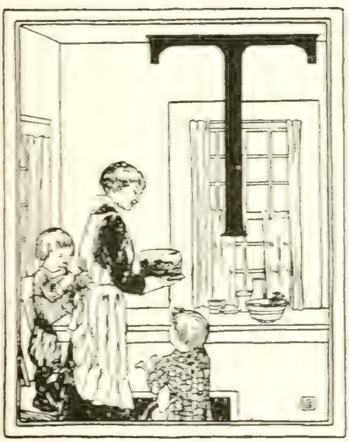
B. T. GALLOWAY, *Director* A. R. MANN, *General Editor*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER AND FLORA ROSE, Supervisors

VOL. IV. No. 73 OCTOBER 1, 1914 FOOD SERIES No. 12

MAKING CAKE.—PART I

KATHERINE H. MILLS



THOSE housekeepers are few who do not recall more than one failure in making cake for the celebration of special occasions. But how great is the satisfaction when the work is successful! The joy of good cookery, as of all good work, comes from the ability to perform the task skillfully and well. Resulting from many experiments, both successful and unsuccessful, this lesson is laid before the housekeeper in the hope that by means of it her failures may be fewer and success in cake making will be practically certain.

The dictionary defines "cake" in somewhat cumbersome style, as "a sweetened composition of flour and other ingredients, leavened or unleavened, baked in a loaf of any size or shape." This definition includes, of course, the cakes of the Old World which are made with yeast and are allowed to rise before baking. Only loaf and layer cakes made by some method other than by the use of yeast will be discussed in Parts I and II of this lesson.

REQUIREMENTS OF A GOOD CAKE

A well-made cake properly baked, should be of uniform thickness, that is, it should not have risen high in the middle or at one side of the tin and have fallen at other places. Unevenness shows either the use of too much flour or carelessness in baking.

It should be fine and even grained and delicate in texture. Poor texture and grain indicate careless mixing or measuring, or the use of a poor recipe.

It should be light, tender, and moist but not sticky. If cake is sticky too much sugar has been used, or the baking has not been completed. If it is dry too much flour has been used. Heaviness in cake is due to a variety of causes: baking in too cool or too hot an oven; the use of too little or too much baking powder, too much fat, too much sugar.

It should be friable, or, in other words, it should easily break in pieces, although it should not crumble.

There should be no suggestion of rawness, or, on the other hand, of over-baking with dryness and breadiness.

The crust should be tender and friable, of uniform light brown color, and should tend to thinness rather than thickness.

UTENSILS NEEDED

In choosing utensils for this work it is well to remember that success depends to a large extent on thorough mixing of the ingredients. It is wise, therefore, to choose utensils that will most effectually aid in the process.

Bowl.— A round-bottomed earthenware bowl lends its shape best to the thorough beating of the cake batter.

Spoons.— Any large spoon may be used for stirring the batter, but a wooden spoon prevents noise, does not darken the mixture, and is easy and light to manipulate. Several uniform tablespoons and teaspoons should form a part of the kitchen equipment. If teaspoons and tablespoons of varying capacity are used, it is impossible to get the same result twice from any recipe.

Egg beaters.— A heavy dover egg beater, although noisy, is rapid, efficient, and thorough, causes much air to be included in the eggs, and may be used with a bowl in place of a cake mixer for mixing the batter. A strong, large beater should be chosen for this purpose, since it is not so hard to manipulate as is a small one, and the cogwheels are less likely to slip when flour is added to the mixture. Of course the dover egg beater cannot be used in beating a stiff and heavy batter, such as fruit-cake batter after the fruit has been added, for the fruit will clog the wheels. A wire whisk is valuable for beating eggs when lightness, rather than fineness of grain, is desired. If no egg beater is at hand, a four-tined silver fork is an excellent utensil for beating eggs.

Measuring cups.— Uniform results cannot be expected by inexperienced cooks without the use of a measuring cup. In all modern recipes such a cup is used as a basis for measuring. Measuring cups cost only a small sum and can be bought at any good hardware store. It is a great convenience to have several cups — one or more of tin for dry or hot ingredients, and at least one of glass for measuring liquids.

Spatula.— A spatula, or knife having a round, blunt blade that bends easily, is especially useful in removing the cake from the tin after baking and in scraping the batter from the bowl.

Flour sifter.— Any good flour sifter may be chosen, but many cooks prefer a round-bottomed, wire-handled, wire sieve of the kind used for straining soups. Such a sieve may be pushed down into the flour, and the flour will work its way up through the meshes. In this way the flour is sifted once by the mere process of pushing it down into the container, and the usual method of shaking the sieve gives a second sifting. This is a quick method of sifting flour, and the strainer is small enough to be left in the flour box when not in use.

Cake mixers.— Probably the most rapid method of mixing cake is by the use of a cake mixer. This utensil costs $1.75, and if large quantities of cake are to be made, or if cake must be made frequently, the expense is quite justifiable.

Cake pans.— An old tin pan, one that has been used frequently, is better for baking cake than a new one, as the cake is less likely to scorch or to stick to tin that has been seasoned by use than to new tin. New tin should be seasoned by greasing it well with unsalted fat and baking it thoroughly in the oven until it has a bluish, unglazed appearance.

The tube pan is the most satisfactory for some kinds of cake. The tube allows a current of warm air to rise through the center of the cake, so that it bakes very evenly; and the tendency is for the cake to rise lighter in the tube pan than in a tin that has no tube. A broad, shallow pan is, in general, more desirable than a deep, narrow one. This is because the shallowness of the tin makes it possible for the heat to penetrate quickly and evenly through all parts of the batter. With the deep pan, while the center of the cake is being baked through, the crust is likely to become thick, tough, and dry. The shallow pan obviates this. In rich fruit cakes, however, in which lightness is not essential, this drying-out is not undesirable. Cakes of this kind are frequently baked in deep pans, and some precautions are taken to keep the under and upper crusts soft — as a slow oven, heavy paper placed over the cake, and asbestos placed under it.

INGREDIENTS

Of course it goes without saying that the ingredients used in making cake should be of good quality, fine flavor, and agreeable odor. While it is often possible to substitute a cheaper ingredient for the more expensive one called for, no attempt should be made to substitute one that is inferior of its kind.

Flour

A good grade of flour is essential, and, even with good flour of standard grade, each new purchase of flour presents a new problem in the quantity of water that the flour will absorb — a problem which the housekeeper can solve only through experimentation. Moreover, bakers state that the last of the flour in a barrel may differ from that which was used first from the same barrel, because of the effect of aging, and because the barrel may have been stored in a damp place where it has absorbed moisture, or in a warm, dry place where the flour may have dried somewhat.

Quantity of flour to use

All modern recipes require that flour be sifted before being measured. It is interesting to note that, even with careful measuring, the same housekeeper, measuring a number of cupfuls of flour by the same cup, will vary the amount of each cupful. The following table shows these wide variations in amount, and thereby shows why a second sifting of flour before measuring is desirable for accuracy. It will be noted that flour that has been sifted twice varies less in the weight of different cupfuls than flour that has been sifted only once or not at all.

TABLE 1. VARIATION IN WEIGHT OF ONE CUPFUL OF FLOUR

(28.35 grams = 1 ounce)

Unsifted one cupful flour weighs..........	118 to 133 grams
Sifted once one cupful flour weighs........	118 to 121.5 grams
Sifted twice one cupful flour weighs.......	117.5 to 118.5 grams

For the above reason, no entirely definite or accurate amount of flour by measure can be specified successfully in a recipe for cake. The only way to accomplish good results is to learn through experience what special degree of stiffness is necessary to success, or to weigh instead of measure the materials to be used.

Bread and pastry flour

Bread flour to which fifteen per cent of cornstarch has been added makes an excellent substitute for pastry flour, and is preferred by many for making cake. It produces more uniform and better results than can be gained with the average pastry flours, which are of inferior grade. The substitution of two tablespoonfuls of cornstarch to each cupful of bread flour is sufficiently accurate for any recipe, and will produce good pastry flour. Thus, in a cake requiring three cupfuls of flour, six tablespoonfuls (or one third of a cupful) of cornstarch, and two and two thirds cupfuls of bread flour, would be required. Bread flour contains more gluten than does pastry flour, and thus it gives a more elastic, stiffer dough than

does a flour containing more starch and less gluten. Therefore, if bread flour is used without being mixed with cornstarch, less flour than the recipe calls for is needed, or else more fat than is specified should be included in the cake; otherwise it may be tough and bread-like. The same conditions would result from the use of too much pastry flour. If there is too little flour in a cake, it will fall, because there is not enough gluten to stiffen on baking and to hold the cake up. The starch in flour acts as a binder. It absorbs water, thickens the cake, softens it, and gives it body.

Sugar

Granulated sugar

Sugar to be used for cake should be fine-grained rather than coarse-grained, since fine-grained sugar dissolves in smaller particles than does coarse-grained, and thus it may be more thoroughly and easily incorporated into the batter; and when fine-grained sugar is used in making cake, more air is included than when coarse-grained sugar is used, and the cake has a finer grain.

Brown or powdered sugar

If brown or powdered sugars are to be substituted for granulated sugar, the substitution should be by weight instead of by measure. This is because the same measure, both of brown and of powdered sugar, will vary greatly in weight. If sifted and piled lightly into a measuring cup, one and one third to one and one half cupful of powdered or brown sugar will be required to equal one cupful of granulated sugar; while either may be packed very closely into the cup, and the weight will then approximately equal one cupful of granulated sugar. There is no doubt that the baker's method of weighing rather than measuring ingredients for cake making would improve results in the household if only the housekeeper would accustom herself to the same practice.

Sugar adds moisture to the cake. If too little sugar is used, the resulting cake may be light, but it will tend to be bread-like and coarse in texture. On the other hand, too much sugar causes the cake to rise very light in the oven at first, but it may fall before the baking is finished. The crumb will then be moist and sticky, and the crust will be sugary and gummy

Baking powders and soda

Baking powder is a chemical preparation made from soda, an acid substance, and a drying agent. When brought into contact with water the acid acts on the soda, and a gas, carbon dioxid, is produced, which helps to make batter and dough mixtures light.

The strength of baking powder depends on its ability to produce carbon dioxid. It is essential, therefore, that the mixture of soda and acid be kept dry if the ingredients are not to combine. In order to prevent loss of strength, a drying agent such as starch, which will absorb moisture, is added to the mixture of soda and acid and the baking powder is kept in sealed tin cans or glass jars.

Types of commercial baking powders

There are three types of baking powder on the market. All of them contain bicarbonate of soda and starch, and they differ only in the acid constituents.

Cream-of-tartar baking powder.—The average standard high-priced baking powders contain, as the acid constituent, cream of tartar or tartaric acid, or a mixture of the two. Soda and a drying agent constitute the other ingredients.

Phosphate baking powder.— In a second type of baking powder the soda and starch are combined with an acid phosphate, and this type is therefore called phosphate baking powder.

Alumic baking powders.— The third type of baking powder is the alum powder. If the label on the box of baking powder contains the words " aluminum " or " alumic," the purchaser may know that an alum baking powder forms the contents of the box. As with the other baking powders, soda and a drying agent form part of the mixture.

Homemade baking powder

A very satisfactory baking powder may be made at home after the following recipe:

$\frac{1}{4}$ pound of cream of tartar
$\frac{1}{8}$ pound of soda
1 ounce of cornstarch

Weigh carefully and mix very thoroughly by shaking the soda and starch together in a tin or glass can. Add the cream of tartar last, and shake again thoroughly and vigorously for several minutes. Or mix all ingredients together and sift twelve times. The secret of success is very thorough mixing of the three ingredients.

This baking powder deteriorates if kept for any length of time, and should therefore be prepared in quantities small enough to last for only ten days or two weeks.

Do not attempt to keep baking powder, either commercial or homemade, in a paper bag. It should be placed in a dry tin or glass receptacle, covered tightly, and stored in a dry place.

Soda and cream of tartar

Soda and cream of tartar may be substituted for baking powder by using them in the same proportion as is given in the recipe for home-made baking powder, and using a quantity equivalent to that called for in the recipe. Thus, if a recipe calls for three teaspoonfuls of baking powder, a very little less than one teaspoonful of soda and two scant teaspoonfuls of cream of tartar may be used, disregarding the starch filler entirely.

Sour milk, molasses, fruit, and chocolate all contain acid substances that react with soda, and may take the place of a part or all of the acid needed to act with soda.

If more soda is put into the cake than is needed to neutralize the acid used with it, this excess of soda will give the cake a yellow color. Also, the excess of soda will unite with the fat in the cake, and this accounts for the peculiar soap-like taste sometimes found in a cake that contains too much soda. If the soda is not thoroughly mixed into the batter, little brown specks or spots will appear in the cake. It is therefore better to stir the soda into the liquid than to add it to the dry ingredients. In this way thorough solution and mixing is assured.

The use of soda with sour milk or buttermilk will be discussed more fully in another part of the lesson.

Eggs

Fresh and preserved eggs, and egg powders

The eggs to be used for cake do not need to be strictly fresh in order to produce a light cake or even a cake of good flavor. They must, however, be sound and in good condition. When eggs are high in price, good, sound, cold-storage or water-glass eggs may be used instead of fresh eggs. When the price of eggs is above twenty-six or twenty-seven cents a dozen, egg powders may be used successfully in making cakes containing fats; but, so far, in cakes of the sponge-cake type the substitution of egg powders for fresh eggs has proved unsuccessful.

Effect of eggs on cake

Eggs give to cake a certain lightness and a marked fineness of texture. They help to hold together the various ingredients. This is particularly noticeable in rich cake, in which, as the amount of fat and the tenderness of the cake increase, an increase in the number of eggs will help to overcome the tendency of the cake to fall apart. This property is possessed to a greater extent by the white of the egg than by the yolk.

On the amount of air entangled in the eggs and held up by the gluten in the flour depends the lightness of cakes of the sponge-cake type, which, after all, are a form of omelet rather than of cake. In this type of cake no baking powder is needed, because the air included in the eggs is sufficient to lighten the comparatively small quantity of flour used. For this reason, in making sponge cakes the yolks and whites of the eggs are beaten separately, so as to include as much air as possible in the whites. The whites should be beaten until they are stiff, but not too dry, otherwise some of the air cells will be ruptured and the cake will shrink more than it should when taken from the oven.

Effect of heat on eggs

The coagulation of eggs takes place at a comparatively low temperature, and they are toughened if cooked too long or at too high a temperature; hence the necessity of a moderate oven if the sponge or angel cake is to rise to its fullest height and be tender. The addition of cream of tartar or of lemon juice helps the egg to coagulate at a still lower temperature than it otherwise would, and also probably dissolves some of the gluten of the flour, thus helping to make the cake tender. On the other hand, too cool an oven causes the sponge cake to expand until it is very light, and then to fall because there is not sufficient heat to cause the cake to harden; or else the cake does not bake through, and, although sufficiently cooked on the outside, is raw in the center.

Effect of beating an egg

The question is often asked why the yolks of eggs cannot be beaten as light as can the whites. One third of the yolk of an egg consists of fat, and the presence of fat prevents the yolks from being elastic enough to entangle and hold air. For the same reason, when the white of the egg is mixed with the yolk the mixture cannot be beaten to a stiff lightness.

Effect of increasing or decreasing egg substance in cakes

If a cake recipe is altered so that additional egg whites are used in the place of egg yolks, more fat should be added, the proportion being one teaspoonful of fat for each additional white. If the number of eggs in a cake is increased, the amount of baking powder should be decreased, provided the quantity of flour and sugar remains in the same proportion. A general statement may be made to the effect that one teaspoonful of baking powder will replace one egg. This is illustrated in formula I as compared with formula IV (page 1457).

Fat

Types of fat good for use in cake making

Fat to be used in making cake should possess a good flavor and odor. The substitution of fresh lard for part of the butter can hardly be detected in the flavor or the texture of the product. Cake made of a good grade of cottonseed oil tastes and smells slightly of the oil when the cake is warm; but when it is cold the flavor is nutty and pleasing, the cake is fine-grained, light, and soft, due to the use of the soft fat, and the keeping quality is excellent. Cottonseed cooking oil may be obtained for $1.25 a gallon, and it is therefore economical for use in the place of butter. Chicken fat, properly tried out, is an excellent substitute for butter. The pieces of fat should be put into the double boiler and tried out over hot water. This prevents the fat from becoming too hot and from developing a strong flavor.

How to substitute other fats for butter

The following table will assist the housekeeper who wishes to substitute a fat that is cheaper than butter, for all or a part of the butter, in making a cake. The table is arranged on the basis of what would be the correct substitute if the recipe called for one half cupful of butter, and may, of course, be increased or decreased according to the amount of fat called for in the recipe:

TABLE 2. SUBSTITUTES FOR FAT

Equivalent of ½ cup of butter	1. ½ cupful chicken fat
	2. ½ cupful lard less 1 tablespoonful
	3. ½ cupful lard substitute less 1½ tablespoonful
	4. ¼ cupful butter plus 3 tablespoonfuls lard
	5. ¼ cupful butter plus 3 tablespoonfuls lard substitute
	6. ½ cupful cottonseed oil less 1 tablespoonful

The reason why a less amount of the softer fats than of butter is needed, is in part because the former contain less moisture, and therefore possess greater shortening power, than does butter; and in part because of the absence in the softer fats of foreign substances, such as the curd, salt, and buttermilk found in butter.

When an unsalted fat is used in making cake, a little salt should be added to the mixture; otherwise an essential flavor may be missed.

The effect on cake of a large amount of fat

A very rich cake — that is, a cake that contains a large amount of fat — will be close-grained; while one that contains a small amount of

shortening will be porous, and will dry out quickly. Too much fat will cause a cake to crumble, and will make its removal from the tin without breaking into pieces a difficult process. A large excess of fat will also cause the cake to be heavy. If the proportion of fat given in a recipe is increased, there should be a corresponding increase in the amount of flour, and also in the amount of either baking powder or eggs.

Melted fat

When melted fat is added to a cake batter it should not be hot, as hot fat is likely to make the cake tough, coarse in grain, and not so light as it should be.

Cream

The use of sour cream and sweet cream will be discussed under the subject of liquids.

Liquids

Milk and water

Sweet milk, either whole or skimmed, is the liquid most generally used in making cake. Other liquids may be used, however, with good results, if their nature is thoroughly understood. Water may be substituted for milk, although its use may cause a slight toughness in the cake. Solids form about twelve per cent, or one eighth, of the composition of milk; therefore seven eighths of a cup of water is equivalent to one cup of skimmed milk.

Whey

Sweet fresh whey, or sour whey to which a very little soda has been added, is an excellent substitute for sweet milk. Not over one eighth of a teaspoonful of soda should be added to one cupful of sour whey. With either of these the amount of baking powder that the recipe required should be used.

Potato water

Water in which potatoes have been boiled may be used as a substitute for sweet milk in making cake. The result in this case will be a moist cake and one that does not dry out quickly. Merely substitute the potato water for the full amount of liquid as required by the recipe.

Sweet cream

Sweet cream may be used in place of sweet milk; in that case less fat than is called for in the recipe, and more cream than the amount of milk

called for, should be used. If the cream is used as a substitute for both butter and liquid, the following table will give the approximate equivalents, according to the quality of the cream:

TABLE 3. APPROXIMATE AMOUNTS OF FAT AND OF MILK IN ONE CUPFUL OF SWEET CREAM OF DIFFERENT GRADES

Grade of cream	Percentage of fat contained	Equivalent to
Thin cream	20	$\frac{3}{4}$ cup sweet skimmed milk plus 4 tablespoons of fat
Medium cream	25	$\frac{3}{4}$ cup sweet skimmed milk less 1 tablespoon plus 5 tablespoons fat
Heavy cream	40	$\frac{1}{2}$ cup sweet skimmed milk plus $\frac{1}{2}$ tablespoon plus $7\frac{1}{2}$ tablespoons fat
Very heavy cream	50	$\frac{1}{2}$ cup sweet skimmed milk less $1\frac{1}{2}$ tablespoon plus $9\frac{1}{2}$ tablespoons fat

Thus, one cupful of what is sold as thin cream contains approximately 20 per cent of butter-fat, and when used in making cake the result will be practically the same as though three fourths of a cupful of sweet skimmed milk and four tablespoonfuls of fat had been used in making the cake.

How to substitute sour milk for sweet milk, or sweet milk for sour milk, in any cake recipe

Either sour milk or buttermilk may be substituted for sweet milk. The resulting cake will be more tender than if made with sweet milk, possibly because both the acid of the milk and the alkali of the baking soda dissolve some of the gluten of the flour. If milk is just turned — that is, is neither sweet nor sour — warm it a little above blood heat and let it stand in a warm place, but do not scald it. In a very short time it will be well soured.

If buttermilk or sour milk is substituted for sweet milk, the following plan is advisable: First neutralize the acidity of the liquid by stirring into it thoroughly a sufficient quantity of soda. Ordinarily this would be about one fourth of a teaspoonful of soda to one cupful of sour milk or buttermilk. Then add sufficient baking powder to make the cake light. This plan is better in most cases than to use soda alone. Thus: One fourth of a teaspoonful of soda used with sour milk is equivalent to about one teaspoonful of baking powder; so that if a recipe using one cupful of sweet milk calls for three teaspoonfuls of baking powder, and sour milk is used in place of the sweet milk, one fourth of a teaspoonful of soda and two teaspoonfuls of baking powder will be required for the cake.

Again, a recipe using one half of a cupful of sweet milk and four teaspoonfuls of baking powder will require, with one half of a cupful of sour milk in place of the sweet milk, one eighth of a teaspoonful of soda and three and one half teaspoonfuls of baking powder; since in this case, one eighth of a teaspoonful of soda is the equivalent of only one half a teaspoonful of baking powder.

Sour cream

Sour cream may be used in the place of both fat and sour milk, or buttermilk in some recipes.

Thick sour cream varies from $33\frac{1}{3}$ per cent to 50 per cent, roughly, in the amount of fat it contains; very thick sour cream unmixed with sour milk contains at least 50 per cent of fat.

Since one cupful of sour cream would be equivalent to one third to one half of a cupful of fat plus two thirds to one half of a cupful of sour milk or buttermilk, it is evident that sour cream should be substituted only when the proportion of fat to liquid called for in the recipe is at least one third of a cupful of fat to one cupful of liquid. In cake formula III (page 1457) is given a good illustration of this substitution. This recipe calls for three fourths of a cupful of fat, three fourths of a cupful of liquid, and three to four teaspoonfuls of baking powder. One and one half of a cupful of very thick cream would be the equivalent of both fat and liquid, and no additional fat would be required.

Sour cream should be treated as though it were sour milk, however, in adding soda and baking powder. Since one fourth of a teaspoonful of soda neutralizes one cupful of sour milk or buttermilk, it will also neutralize one cupful of sour cream.

Fruit

Fruit is added to cake in order to give flavor, to add weight, and to improve the keeping qualities.

Types of fruit.— Several types of fruit are commonly used in making cake; first, dried fruits and candied fruits, such as currants, raisins, citron, cherries, pineapple; second, fresh raw fruits, such as blueberries and cherries; third, cooked fruit pulp, such as apple sauce and blackberry jam.

Effect of fruits on batter.— As a general rule it may be said that when fruit is used in making cake, the batter will need to be stiffer than for ordinary cake, the stiffness depending on the weight of the pieces of the fruit to be held in place. Thus, a cake dough containing raisins will need to be stiffer than one containing blueberries, and a cake dough containing blueberries will need to be stiffer than one made with apple sauce or jam.

Effect of fruit on shortening.— More shortening should be used for cakes made with dried fruit than for those made with fresh fruit or fruit pulp, because more flour is needed with the former.

Effect of fruit on baking. – The presence of particles of dried fruit increases the difficulties in baking cake, as fruit scorches easily and some of the fruit will be at the surface of the cake. Rich fruit cakes should therefore be baked in a very slow oven. This not only prevents scorching, but also improves the flavor, since the fruit flavor blends with the flavor of the other ingredients.

Chocolate and cocoa

Chocolate.— Chocolate contains a hard fat which adds richness to cake, but which tends to make it stiff as it dries out or if the cake is kept in a very cold place. Chocolate cake that is made with sour milk and soda is usually softer and darker in color than that made with sweet milk and baking powder. Chocolate contains starch, which thickens the batter, so that less flour is needed for chocolate cake than for white cakes. Alkali darkens a chocolate mixture, and a little soda added to the melted chocolate before putting it into the batter will not only darken the cake, but also neutralize any free fatty acid in the chocolate and help to make the cake light. The large amount of soda in some recipes for chocolate cake serves the same purpose.

Cocoa.— Cocoa should be substituted for chocolate by weight instead of by measure. In manufacturing cocoa nearly all of the fat has been removed from it, so that cakes made by substituting cocoa in a recipe calling for chocolate are likely to be bready unless a small quantity of additional fat is added (the equivalent of about one half tablespoonful of butter for each ounce, or one fourth cupful, of cocoa used).

Molasses

Molasses contains free acid, and when used in cake the acid should be neutralized by adding one half of a teaspoonful of soda for each cupful of molasses. Molasses may be substituted for sugar in rich fruit cake; when this is done the amount of liquid should be decreased proportionately to the amount of molasses used. One cupful of molasses contains only as much sugar as seven tenths of a cupful of sugar.

Spice

When spice is added to cake, it should first be scalded with boiling water; about two teaspoonfuls of boiling water should be added to each teaspoonful of spice. The boiling water thickens the spice, insures better mixing, takes away any raw taste of spice in the cake, and gives a rich

dark color. A second method of adding spice to cake is to sift it with the baking powder and the flour. The former method is preferable, however, since unmoistened spice has a tendency to make cake dry and bread-like, and does not give the cake so fine a flavor as when the spice is scalded.

Nuts

Nuts are lighter than fruit and are not likely to settle to the bottom of the tin; therefore they do not need to be floured. They contain fat, and, when added to rich cake, the amount of fat in the recipe should be decreased in proportion to the richness added by the nuts. One to one and one half tablespoonful less of fat to each cupful of nuts is usually sufficient. A good method of preparing nuts for cake is to grind them through the coarse knife of the food chopper. When English walnuts or other nut meats are bought already shelled, they should be washed and dried in the oven before being used.

Flavoring extracts

Vanilla, lemon, and other flavoring extracts, should be used sparingly if at all. A strongly flavored cake is not so pleasing as one of delicate flavor. In fact, the very noticeable flavor or odor seems to imply that the main ingredients of which the cake is made are of inferior grade and that there is some unpleasant quality about the cake that it is desirable to conceal. Good cake, made from sweet, clean materials, needs no strong extracts to make it desirable.

STEPS IN THE PROCESS OF MAKING CAKE

Time is usually saved if all utensils and ingredients are brought together ready for use before beginning to make a cake.

Read the recipe carefully two or three times, so as to get the idea of it thoroughly in mind.

The flour should be sifted twice, measured, mixed with the baking powder, and sifted again.

The cake pans should be greased with unsalted fat, then lightly dredged or sifted over with flour, and the flour shaken out. Lard is a very satisfactory fat for greasing a cake tin. If butter is used, it should first be clarified by melting it and then allowing it to stand until the salt and the curds of sour milk have settled. Only the clear melted fat should be used in greasing the pan; if the salt and curds are used with the fat, that may cause the cake to stick to the pan. If the pan is very black because of burnt-in substances, is much dented, or is inclined to rust, it is well to line the bottom with waxed or greased paper and grease only the sides.

See that the oven is ready to receive the cake. Too hot an oven is more destructive to good results in making cake than one that is too cool. If coal is used, do not attempt to use the oven for baking just after coal has been put into the stove nor after it has been nearly burned out; in the latter case the coal must be replenished before the cake is done, thus cooling the oven.

Selection of a recipe

In selecting the recipe, the housekeeper should consider the occasion for which the cake is to be used, how long it is to last, and the limitation of her purse. In the days of our grandmothers, pound cake was served to company at tea. That was because pound cake is rich and its richness makes it keep well. Our thrifty grandmothers were thus provided for the unexpected. On the other hand, for children, or when the cake is to be eaten soon after baking, or in summer, when the appetite craves light food, or to serve with ice cream, already rich, the less rich cakes are preferable to those containing a large quantity of shortening.

Methods of mixing cake

There are several ways of mixing cake, and much controversy has arisen among housekeepers as to the method that will give the best results. It has been the experience of the writer that, if the mixing of ingredients has been very thorough, the method of mixing does not greatly influence the result obtained. Differences in results are due to variations in the thoroughness with which the ingredients have been mixed, rather than to the order or manner of mixing.

Method I for mixing cake

1. Cream or soften the fat by stirring it with a spoon or a fork until it is of the consistency of thick, smooth cream. In cold weather, or if the butter is cold, it may be broken into small pieces and placed in a warm bowl while the creaming is being done, and time will thus be saved.

2. Add the sugar gradually to the creamed butter, and beat or stir thoroughly until the mixture is light, fluffy, fine-grained, and moist. This is called creaming the butter and sugar together. When much sugar and little butter are used, cream only a part of the sugar with the fat and do not add the remainder of the sugar until after the egg yolks have been stirred into the creamed butter and sugar.

3. Separate the whites and yolks of the eggs, and beat each separately, beating the whites until stiff but not too dry, and the yolks until light and creamy.

4. Add the egg yolks to the creamed butter and sugar, and beat until no suggestion of unmixed yolks may be found.

5. Add the milk alternately with the flour, which has been mixed and sifted with the baking powder; stir vigorously until the mixture is thoroughly blended and of velvety smoothness. This stirring will take about two to five minutes.

6. Fold the stiffly beaten egg whites carefully, but thoroughly, into the mixture, or, in other words, mix them in with as little breaking as possible. The motion, but not the vigorous action, of beating accomplishes this better than the stirring motion. When finished, tiny flecks of egg white should be seen distributed evenly throughout the mixture.

Method II for mixing cake

1. Break the eggs into the mixing bowl without separating the whites and the yolks, and beat them.

2. Add the sugar, and beat thoroughly.

3. Add the milk, and then the flour, mixed and sifted with the baking powder, and beat again.

4. Add the melted fat. The fat should be barely melted and warm, not partially cooked and hot.

5. Beat all thoroughly before putting the mixture into the cake pan.

Method III for mixing cake

1. Measure into the mixing bowl all the liquid ingredients except the melted fat, and beat thoroughly.

2. Measure and add the dry ingredients, and beat thoroughly.

3. Add the melted fat, and beat again.

This method is usually employed for the quick making of plain cakes, when the amount of butter is moderate.

Method IV — the cake-mixer method

1. Measure into the cake mixer all the ingredients.

2. Turn the mixture until the batter is thoroughly mixed. This will require three to ten minutes. In making cake by this method, the butter must be soft before it is added; otherwise it will be merely broken into small particles by the wires of the mixer and will not be thoroughly incorporated into the batter, but will coat over the flour, producing the result of pastry.

Relative merits of various methods

While method I will probably produce the best results with pound cake, and should be used by beginners since it insures the thorough mixing

which is essential to good cake making, the experienced person will find that all methods will produce good results with nearly every cake, provided the ingredients are thoroughly mixed.

The baking of cake

More cakes are spoiled by defects in baking than by defects in either the recipe or the method of mixing the batter. Experience must be the guide to success until reliable oven thermometers have been devised. It is well for the inexperienced to remember that great haste and a very hot oven contribute oftener to failures in the making of cake than do any other causes.

The way to fill the pan.— When the batter is put into the pan it should be brought up against the sides of the pan, by using the spoon or the spatula, so that the center of the cake may be slightly lower than the sides. This helps to prevent the cake from rising higher in the center than at the sides, and brings a large proportion of the batter into direct contact with the heat at the sides of the pan. A pan should never be filled more than two thirds full of batter, for if a cake rises over the sides of the pan it is almost certain to fall afterward.

The location of the pan in the oven.— The pan should be placed on the lower grate of the oven, so that the greatest amount of heat will reach it from underneath and force it to rise to its fullest capacity before the crust is formed on top. If the top crust becomes set too quickly, the cake may later crack and rise in the center while it is much depressed on the sides.

The temperature of the oven.— When a cake rises unevenly because of the uneven temperature of the oven, it will readily be observed that the part of the cake that becomes the lightest is on the cool side of the oven. This is proof that an oven should not be too hot for successful cake making. This applies to practically all types of cake, whether rich or poor in fat and whether many or few eggs are used. If the oven is too hot, the cake does not rise normally; if it is too cool, the cake may become overlight, with subsequent danger of falling.

Experience is the best teacher in determining the correct temperature for baking cake. It is, however, safer to err on the side of coolness rather than have too great heat, in preparing the oven for baking cake.

The time for turning the cake.— If a cake is baking unevenly, it may be turned in the oven, provided the turning be done before the top crust has begun to harden. If the attempt is made after the crust is formed the cake may fall, and it will not rise again. If it falls a little while it is still in the batter stage, it will probably rise again in a normal way.

The length of time for baking a cake. — The time for baking a cake may be divided into four quarters:

First quarter: The cake rises; little bubbles form on the top.

Second quarter: The cake continues to rise, and it browns in spots.

Third quarter: The cake browns all over.

Fourth quarter: The cake shrinks from the sides of the tin, becomes elastic to the touch, and stops singing.

During the baking, the oven heat should be increased gradually but very slightly until the cake is brown, then it may be slightly reduced. On the average a thin loaf of cake will bake in forty minutes, while a thick loaf should bake for at least an hour. Fruit cakes may require several hours.

Methods of cooling the oven.— If the oven is too hot, it may be cooled by leaving the door slightly ajar or by placing a dish of cold water on the grate in the oven. If the cake bakes too fast on top, cover the upper grate above the cake with a piece of heavy paper. If the paper is laid directly on the cake itself and the cake splits open, the paper will probably cling to the batter. If this should happen, the paper should not be removed until after the cake has cooled, when it may be gently torn or scraped off.

The way to determine when a cake is done.— When a cake is thoroughly cooked it will be elastic and will shrink from the sides of the pan. It will spring back and not sink if lightly touched. The singing sound of a cake, when it is still losing gases before the final hardening, will have diminished or will have disappeared when the cake is firm. A clean toothpick stuck into the cake will come out clean or with particles of cooked crumb adhering to it.

The time for removing a cake from the pan.— A few minutes after the cake is taken from the oven, and while it is still warm, remove it from the tin and carefully pull off the paper. If the cake is removed too soon, it falls a little; if not soon enough, it becomes soggy and may stick to the pan.

CAKE FORMULAS

The underlying principle of all cake making is to obtain a proper relationship between the ingredients of which the cake is made, so that there may be a balance between lightness, tenderness, moisture, and texture. In one case lightness may be the important quality; in another, tenderness; in another, fineness of grain; and so on.

A little study of the following formulas will show the principles governing the amounts of the different materials that may be combined in a cake recipe. It is advisable, however, not to experiment with the formulas until after reading and digesting this lesson.

TABLE 4. AMOUNTS OF VARIOUS INGREDIENTS USED

Number of cake formula	Flour (cupfuls)	Sugar (cupfuls)	Fat (cupfuls)	Number of eggs	Liquid (cupfuls)	Baking powder (teaspoonfuls)	Salt (teaspoonfuls)
No. I.........	3	$1\frac{1}{2}$–2	$\frac{1}{4}$	1	$1\frac{1}{2}$	6	$\frac{1}{2}$
No. II........	3	1–$1\frac{1}{2}$	$\frac{1}{2}$	2–3	1	5–4	$\frac{1}{3}$
No. III.......	3	1–$1\frac{1}{2}$	$\frac{3}{4}$	3–4	$\frac{3}{4}$	4–3	$\frac{1}{4}$
No. IV.......	3	1–$1\frac{1}{2}$	1	5–6	$\frac{1}{2}$	3–2	$\frac{1}{5}$

Discussion of the formulas

Read from left to right across the page.

All measurements are level.

If three eggs are used in formula II, use four teaspoonfuls of baking powder; if two eggs are used, use five teaspoonfuls of baking powder.

In formulas III and IV, also, the larger number of eggs requires the smaller quantity of baking powder.

Each of these formulas makes approximately four cupfuls, or one quart, of batter, which may be baked in one very large loaf or two small loaves.

As the amount of fat is increased, the proportion of flour to liquid is decreased. In other words, as the richness of the cake is increased, the amount of liquid is decreased, thus giving a firmer mixture, which protects the rich cake from falling.

As the amount of fat is increased, the number of eggs is increased. This is because the eggs help to make the fat blend with the rest of the cake mixture and hold the cake together.

It is possible to make the cake light, and at the same time rich, without increasing the number of eggs if the amount of baking powder is increased, but the texture will not be so good as when the additional eggs are used. The cake will be more friable, or crumbly, with baking powder than with eggs, but will, of course, lack the richness of color and flavor given to it by the egg yolks. Such a cake should be eaten soon after making, as it dries out rapidly.

Discussion of results produced by the different formulas

Cake formula No. I

This formula produces a light, porous, tender cake. Such cake is very delicious if eaten soon after it is made, but it dries out quickly and loses its tenderness rapidly.

Cake formula No. II

By this formula is also produced a cake that is light and porous in texture, although finer-grained than that from formula No. I. It keeps longer, and is a good cake to be used on any ordinary occasion. It may be varied in many ways, as follows:

For layer cake, use one half the amounts called for in the recipe and bake the batter in two or three layers.

For chocolate cake, add two squares of chocolate (2 ounces, or $\frac{1}{2}$ cupful) and two tablespoonfuls less of flour than is called for in the formula; or while melting the chocolate reduce it to a thick paste with four tablespoonfuls of boiling water, cooking it until thick and of about the same consistency as the cake batter. In the latter case the whole amount of flour may be used.

For nut cake, add one cup of finely chopped or coarsely ground nut meats and two tablespoonfuls less of fat than is called for in the formula.

For spice cake, add one teaspoonful of cinnamon and one half teaspoonful of cloves, wet with two teaspoonfuls of boiling water.

For very dark spice cake, use brown sugar in place of white sugar, and one teaspoonful each of cinnamon, cloves, and nutmeg.

For ribbon cake, add to one third of the batter one half teaspoonful of cinnamon, one half teaspoonful of cloves, one half teaspoonful of nutmeg, and one half cupful of raisins that have been cut into small pieces. Bake the dark batter as one layer and the light batter as two layers, and put the dark layer between the two light layers with a raisin, jelly, or fruit filling.

For white cake, omit the egg yolks and add one tablespoonful of butter to the amount required. Use three more egg whites than is called for in the formula.

Cake formulas No. III and No. IV

These formulas produce cakes of the pound-cake type, which are fine and close in grain and which will keep for some time.

Cakes may be mixed according to the directions given under methods I, II, III, and IV, as described on pages 1453 to 1455. Cakes of the type of formula III and formula IV are in general better made by method I, because this method insures more thorough mixing than do the other methods described, and when much shortening is used the difficulty of thorough mixing is increased.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

Entered as second-class matter at the post office at Ithaca, New York

B. T. Galloway, *Director* A. R. Mann, *General Editor*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER, Supervisor

VOL. IV. No. 73 OCTOBER 1, 1914 FOOD SERIES No. 11

MAKING CAKE.—PART I

DISCUSSION PAPER

By means of the discussion papers we have an opportunity to become acquainted. We shall take it as an indication on your part that you are interested if you answer the questions and return them to us. The staff of the Department of Home Economics is ready to assist in your study of scientific home-making. We want your assistance as well. Ask questions, offer suggestions, let us have the benefit of your experience. You thus become a vital part of the Department of Home Economics in its efforts for scientific housekeeping.

Will you please send your opinions on the following points to the Supervisor of the Cornell Reading-Course for the Farm Home?

1. Have you had experience in making cake as a means of earning money? If so, briefly describe your methods, including advertising, selling, and delivery.

2. What are your uses for stale cake? How do you keep cake moist?

3. What method or what labor-saving device have you found to be the most useful in making cake?

4. Which are the more economical of time, labor, and money — cakes or puddings?

Name..

Address..

Date...

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VOL. IV. No. 75 NOVEMBER 1, 1914 FOOD SERIES No. 13

MAKING CAKE.—PART II

KATHERINE H. MILLS

Success in making cake depends not on the perfect proportion of the recipe but on the thorough understanding of the principles governing the making of cake. In Part I of the lesson on making cake these principles were discussed, in order that the housekeeper might become more certain of her results in making cake and that she might know the reasons for her failures. This part of the lesson should be carefully studied before the recipes given here are tried.

For this same reason a short discussion of the principles of sugar cookery is given before the recipes for cake frostings and fillings. A well-made frosting or filling adds much to the attractiveness as well as the palatability of a cake. It also helps to retain the moisture of the cake and in this way adds to the keeping quality. Cakes may be simply frosted with a quickly made frosting or they may be put together with a rich nut and fruit filling and elaborately decorated. It should be remembered, however, in decorating a cake, or any other object, that the fundamentals are simplicity and good quality.

SELECTED AND TESTED RECIPES FOR CAKE

Sour cream cake

2 cupfuls sour cream	$3\frac{1}{2}$ cupfuls flour
2 cupfuls sugar	3 teaspoonfuls baking powder
4 eggs	$\frac{1}{2}$ teaspoonful soda (scant)

Thick sour cream is equivalent to one third to one half of its measure in fat. The above recipe corresponds very closely to formula II.[1] Two cupfuls of sour cream corresponds to about $1\frac{1}{3}$ cupful of liquid plus $\frac{2}{3}$ cupful of fat, or, reduced to the exact terms of the formula, $1\frac{1}{5}$ cupful of liquid and about $\frac{1}{2}$ cupful of fat (if sweet milk and fat were used instead of sour cream). The baking powder plus the soda corresponds to 5 teaspoonfuls of baking powder alone if used without soda and with sweet

[1] Making Cake.—Part I, page 1457. The Cornell Reading-Courses, Lesson for the Farm Home, No. 73.

milk, or, in terms of the formula, $4\frac{1}{2}$ teaspoonfuls of baking powder. Buttermilk or sour milk may be substituted for sour cream in this recipe by using $1\frac{1}{3}$ cupful of either liquid and adding $\frac{2}{3}$ cupful of fat. The same amount of soda and baking powder that the recipe calls for should be used in this case. The cake made from this recipe may be baked in one large or two medium-sized cake pans.

Sweet cream cake

2 eggs
Sweet cream, of medium grade
1 cupful of sugar
$1\frac{7}{8}$ cupful flour
4 teaspoonfuls baking powder
$\frac{1}{2}$ teaspoonful salt
Flavoring if desired

Break the eggs into a measuring cup and fill the cup with sweet cream of medium grade. Pour the contents of the cup into a mixing bowl, add the sugar and salt, and beat thoroughly until the mixture is well blended. Then add the flour, which has been mixed and sifted with the baking powder. This recipe makes one loaf of cake that is delicious if eaten soon after it is baked, but it dries out quickly.

Lightning cake

$\frac{1}{4}$ cupful butter
2 eggs
Sweet milk
1 cupful sugar
$1\frac{1}{8}$ cupful flour
2 teaspoonfuls baking powder

Melt the butter in a measuring cup, but do not let it become hot. Add the unbeaten eggs to the melted butter, fill the cup with sweet milk, and beat the contents of the cup two minutes with a dover egg beater. Add the sugar and beat again. Then add the flour, which has been mixed and sifted with the baking powder, and beat the whole mixture again. The cake made from this recipe may be baked as drop cakes, and sprinkled with powdered sugar; or it may be baked in one loaf in a small bread pan or in two layer cake tins. Grated orange peel or orange extract may be used for flavoring, or nuts may be added. Frost the cake with a fruit-flavored frosting.

Prize cake

Yolks 4 eggs
Whites 2 eggs
1 cupful sugar
$\frac{1}{2}$ cupful milk
2 cupfuls flour
$2\frac{1}{2}$ teaspoonfuls baking powder
$\frac{1}{3}$ cupful melted butter

Mix by method II[2] and bake the cake in one loaf.

FANNIE MERRITT FARMER

[2]All references made to methods I, II, III, and IV of mixing cake in this lesson refer to Making Cake.— Part I, pages 1453–1455, Reading-Course for the Farm Home, No. 73.

White layer cake

$\frac{1}{2}$ cupful butter	3 teaspoonfuls baking powder
1 cupful sugar	$1\frac{2}{3}$ cupful flour
$\frac{1}{2}$ cupful milk	Whites of 4 eggs, beaten stiff

Mix by method I, leaving out the yolks of the eggs. Bake in two layers or in a loaf. The layers may be put together with any desired frosting.

Ice cream cake

$\frac{3}{4}$ cupful butter	2 cupfuls flour
$1\frac{1}{4}$ cupful sugar	$\frac{1}{4}$ teaspoonful soda
Grated rind and juice of $\frac{1}{2}$ lemon	Whites 6 eggs

Mix by method I, leaving out the yolks of the eggs. This cake, if properly made and baked, is fine grained and very good. In this case the lemon juice is the acid constituent that takes the place of cream of tartar.

JANET MACKENZIE HILL

Bride's cake

$\frac{7}{8}$ cupful butter	4 cupfuls flour
$2\frac{1}{2}$ cupfuls sugar	3 teaspoonfuls baking powder
1 cupful milk	Whites 12 eggs

1 teaspoonful vanilla or almond extract

Mix by method I, leaving out the yolks of the eggs. Care should be taken not to beat the whites of eggs until they are too dry.

Lady Baltimore cake

1 cupful butter	3 cupfuls flour
2 cupfuls sugar	4 teaspoonfuls baking powder
1 cupful milk	1 teaspoonful vanilla

Whites 6 eggs

Mix by method I, leaving out the yolks of the eggs; bake in three layers; put together with Lady Baltimore filling; and frost with twice-cooked frosting. This cake may be made with two, three, four, five, or even six teaspoonfuls of baking powder, and it offers an interesting illustration of the effect of baking powder on cake. With two teaspoonfuls of baking powder, the cake will be close grained, and inclined to be bready. With six teaspoonfuls of baking powder, if the cake is carefully baked, it will

rise very light, falling slightly during the last part of the baking, but will still be very light when the baking is finished. It will be more open in texture and more tender than the cake made with two teaspoonfuls of baking powder. The use of so much baking powder is not advocated, however, since it is not really needed, and it is believed that it is unwholesome to eat a great deal of baking powder. The housekeeper may be interested, however, in experimenting for herself to see the effect of the varying amounts of baking powder in a cake mixture.

Gold cake

1 cupful sugar	1¾ cupful flour
Yolks 8 eggs	4 teaspoonfuls baking powder
½ cupful milk	1 teaspoonful vanilla

½ cupful butter

Mix by method II. Bake in tube cake pans or in small individual cake pans.

Lord Baltimore cake

Use the same recipe as that given for gold cake. Bake in three layers; put together with Lord Baltimore filling; and frost with twice-cooked frosting.

Pound cake (recipe 1)

1 cupful butter	4 eggs
1½ cupful powdered sugar	1 teaspoonful baking powder
2 cupfuls flour	½ cupful milk

Mix by method I; bake the cake carefully in a moderate oven.

JANET MACKENZIE HILL

Pound cake (recipe 2)

1 pound butter	Whites 10 eggs
1 pound sugar	1 teaspoonful mace
Yolks 10 eggs	1 pound flour

2 tablespoonfuls milk

Mix by method I. Powdered sugar will make a finer-grained pound cake than granulated sugar, but the general appearance of the crust is better when granulated sugar is used.

Sponge cake

4 eggs	1 cupful sugar
1 cupful flour	4 teaspoonfuls lemon juice

Separate eggs; beat the yolks until lemon colored; add sugar and beat; fold in flour and then stiffly beaten whites of eggs; bake in an ungreased pan in a moderate oven.

Hot-water sponge cake

2 eggs	½ tablespoonful lemon juice
¾ cupful sugar	1 cupful flour
6 tablespoonfuls hot water	1½ teaspoonful baking powder
¼ teaspoonful salt	

Beat yolks of eggs until thick; add half the sugar, then the water, lemon juice, and remaining sugar; fold in the stiffly beaten whites of the eggs and the flour, which has been mixed and sifted with the baking powder; bake in a greased tin.

Chocolate sponge cake

Use the recipe given for hot-water sponge cake; add two ounces of chocolate which has been reduced to a thick smooth paste with 4 tablespoonfuls of hot water.

Sponge jelly roll

2 eggs	2½ teaspoonfuls baking powder
⅞ cupful sugar	½ teaspoonful salt
1 cupful flour	½ teaspoonful vanilla, if desired
⅓ cupful hot milk	

Mix the ingredients in the order in which they are given. Bake in a well-greased dripping pan in a thin sheet. Be sure that the heat of the oven is such that it will give a good under crust. Turn out on a clean towel or bread board, spread with jelly, and roll.

Angel cake

Whites 8 eggs	1 cupful sugar
¾ teaspoonful cream of tartar	¾ cupful flour
¾ teaspoonful vanilla	Pinch of salt

Sift the sugar twice and the flour and salt four times, measuring the flour after the second sifting as usual. Beat the whites of the eggs until frothy, add the cream of tartar, and continue beating until the whites are stiff, but not too dry. Add the sugar gradually and continue beating. Carefully fold in the flour, salt, and vanilla. Pour the batter into an ungreased tube cake pan, and bake in a very moderate oven. Invert the pan when the cake is removed from the oven, and place it in such

a position that a current of air will surround the cake on all sides. If a chocolate-flavored cake is desired, ¼ cupful of cocoa may be substituted for ¼ cupful of flour.

Mock angel cake

1 cupful sugar	⅓ teaspoonful salt
1⅓ cupful flour	⅔ cupful scalded milk
3 teaspoonfuls baking powder	1 teaspoonful vanilla

Whites 2 eggs

Mix and sift the sugar, flour, baking powder, and salt three times. Pour the scalded milk on this mixture and stir until smooth. Add the flavoring, and fold in the stiffly beaten whites of the eggs. Bake in an ungreased tube cake pan in a moderate oven. This is a good cake to eat with ice cream. It is better if made on the day it is to be eaten, since it toughens and dries out if kept several days.

Soft gingerbread

1 egg	1¾ cupful flour
½ cupful sugar	1 teaspoonful ginger
½ cupful New Orleans molasses	1 teaspoonful cinnamon
¾ teaspoonful soda mixed with 1 cupful sour milk	¼ teaspoonful salt
	¼ cupful butter

Mix by method II; bake the cake for one half hour in a shallow, paper-lined pan.

Maggie's molasses cookies

1 egg	3 cupfuls flour
1 cupful sugar	1 teaspoonful cinnamon
1 cupful molasses	¼ teaspoonful cloves
1 teaspoonful soda mixed with 1 cupful sweet milk	¼ teaspoonful salt
	¼ cupful butter

¼ cupful lard

Mix by method II, bake the mixture in muffin pans.

Apple sauce cake

1 cupful sugar	1½ cupful unsweetened apple sauce
1 tablespoonful cinnamon	2½ cupfuls flour
½ tablespoonful cloves	½ cupful butter
2 teaspoonfuls soda	1 cupful raisins

Mix the first three ingredients in the order in which they are given in the recipe. Stir the soda into the apple sauce, and let this mixture foam over into the ingredients already mixed. Add the flour, the butter which has been melted, and the raisins which have been dredged with two tablespoonfuls of flour. In this cake the large amount of soda helps to make the cake soft and light. The large amount of spices and fruit prevent the soda from giving the cake a soapy taste.

Boiled-raisin cake

1 cupful raisins	1 teaspoonful soda
1½ cupful water	1 teaspoonful cinnamon
1 cupful sugar	1 teaspoonful nutmeg
1 egg	1 teaspoonful cloves
2 cupfuls flour	½ teaspoonful vanilla

½ cupful shortening

Boil the raisins slowly in the water until there is one cupful of water left and the raisins are plump, and allow the mixture to cool. Then add the sugar, egg, flour which has been mixed and sifted with the soda, spices which have been wet with 3 teaspoonfuls of boiling water, and the melted shortening. If the cake is to be eaten within a day or two, the amount of shortening may be reduced to ¼ cupful.

Date cake

1⅓ cupful brown sugar	½ teaspoonful cinnamon
2 eggs	½ teaspoonful nutmeg
½ cupful milk	½ teaspoonful cloves
1¾ cupful flour	½ teaspoonful salt
3 teaspoonfuls baking powder	½ cupful shortening

½ pound dates, stoned, cut in pieces, and lightly floured

Mix the ingredients in the order in which they are given, using method II.

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English gingerbread cake

1¾ cupful flour	½ cupful butter
½ cupful raisins	1 cupful molasses
½ cupful nut meats, broken in pieces	½ cupful sugar
	1½ teaspoonful cinnamon
2 eggs	1½ teaspoonful cloves
½ teaspoonful soda	1 teaspoonful ground ginger

Mix together flour, soda, raisins, and nuts. Put butter, molasses, and sugar into a saucepan, and boil the mixture for one minute after boiling commences. Beat the eggs and stir the boiling mixture into them, stirring vigorously. Add this mixture to the dry ingredients, and mix thoroughly. This recipe makes one loaf of cake which can be kept for a long time.

Spice cake

- 1 egg
- ½ cupful sugar
- ½ cupful molasses
- ½ cupful sour milk
- ½ teaspoonful soda stirred into milk
- 1¾ cupful flour
- 2 teaspoonfuls baking powder
- ½ teaspoonful cloves
- ½ teaspoonful cinnamon
- ½ teaspoonful allspice
- ½ cupful shortening
- ½ cupful raisins, cut into small pieces and floured lightly

Mix the ingredients in the order in which they are given. This recipe may be varied by omitting the raisins and adding nuts, currants, or citron.

Nut spice cake

- ½ cupful butter
- 1 cupful brown sugar
- ½ cupful molasses
- Yolks 4 eggs
- 1 cupful sour milk
- ½ teaspoonful soda
- 2½ cupfuls flour
- 1½ teaspoonful baking powder
- ½ teaspoonful cloves
- 1 teaspoonful cinnamon
- ¼ nutmeg, grated
- 1 cupful raisins
- ½ cupful currants
- ½ cupful English walnut meats

Sweet milk and 3½ teaspoonfuls baking powder may be used instead of sour milk and soda. It will be noted that this recipe differs from the one given above for spice cake in the amount of each essential ingredients except molasses and fat. Each one of these recipes, however, is well balanced and cake made by either of them will keep moist for several days.

Coffee cake

- 1 cupful butter
- 2 cupfuls brown sugar
- 5 eggs
- 1 cupful black coffee
- 1 teaspoonful soda
- 3 cupfuls flour
- 1 pound raisins, 1 pound currants } or 2 pounds raisins
- 1 teaspoonful cinnamon
- 1 teaspoonful cloves
- ½ teaspoonful allspice

Compared with the formulas[3], this recipe corresponds to cake formula IV, except that the amount of liquid is increased in order to balance the large amount of dry fruit that is included. The soda should be mixed with the coffee.

Dried-apple cake

1 cupful dried apples
1 cupful molasses
½ cupful butter
1 teaspoonful soda dissolved in
  1 cupful sour milk or buttermilk
1 egg
1 cupful sugar
3½–4 cupfuls flour
1 teaspoonful cinnamon
1 teaspoonful cloves
1 teaspoonful nutmeg
1 cupful raisins, lightly floured

Soak the dried apples over night, drain them, and cook them with the molasses until the mixture is thick. The cooking will require about half an hour. Add the butter to the hot mixture and allow it to cool before adding the remaining ingredients. Bake this cake in a good-sized loaf; it can be kept for some time.

Wedding fruit-cake

1 pound flour (browned)
1 pound brown sugar
1 pound butter
1 pound almonds, bleached and cut fine
1½ pound raisins
12 eggs
Juice of 2 oranges
Juice of 2 lemons
1 pound figs
1 pound currants
1 nutmeg, grated
3 tablespoonfuls cinnamon
1 tablespoonful cloves
½ pound citron, cut fine
1 teaspoonful soda dissolved in
  ½ cupful black coffee

Mix fruit and nuts together and dredge with browned flour. Beat sugar and butter to a cream, and add beaten eggs, fruit juice, and coffee. Add the other ingredients and stir the whole mixture well. Place thick buttered paper in the pans before pouring in the cake mixture. Bake the cake in a very slow oven.

Chocolate caramel cake

½ cupful grated chocolate
  (2 squares, or 2 ounces)
¼ cupful butter
1 cupful sugar
2 eggs
½ cupful milk
1 cupful flour
2 teaspoonfuls baking powder

[3] Given on page 1457 of Making Cake.—Part I.

Steam the chocolate until it is soft, add the butter, and stir until the butter is melted. Add the sugar, and allow this mixture to cool before adding the remaining ingredients. Bake the cake in two or three layers and put them together with caramel filling.

Dom econ cake[4]

2 ounces (2 squares) chocolate, grated	1 cupful flour
¼ cupful butter	¾ teaspoonful soda mixed with ¼ cupful sour milk
½ cupful boiling water	1 egg
1 cupful sugar	

Mix the ingredients in the order in which they are given. The boiling water will melt the chocolate and butter. Do not wait for the mixture of chocolate, butter, and water, to cool before adding the other ingredients. The cake batter will be exceedingly thin but must not be thickened. Bake as a loaf cake and frost with twice-cooked frosting flavored with chocolate. A delicious variation of this cake is to bake it in two layers in a moderate oven, put it together with chocolate filling, and ice it with boiled or twice-cooked frosting. If properly baked this cake will be delicious and moist. It can be kept for several days.

Chocolate puffs

1¼ cupful flour	¼ teaspoonful salt
1 cupful sugar	1 egg
2 teaspoonfuls baking powder	Milk
1 tablespoonful melted butter	2 squares chocolate, melted

Mix and sift together the flour, sugar, baking powder, and salt. Break one egg into a measuring cup, fill the cup with milk, and add the contents of the cup to the dry ingredients. Beat this mixture thoroughly and add the melted butter and the melted chocolate. This cake is easily and quickly made. It should be baked in small gem pans. It is delicious when eaten at once, but dries out very quickly.

Chocolate fudge cake

2 eggs	2½ cupfuls flour
1 cupful sugar	1 teaspoonful soda mixed with ½ cupful hot water
½ cupful molasses	3 squares chocolate, melted
½ cupful sour milk	

½ cupful melted butter

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[4] Dom econ, a shortening of domestic economy, is the popular name among the students at the College for the Department of Home Economics. This recipe for cake has been gradually evolved by the students and teachers in their work in the Department and has received its name from the girls.

Devil's food

4 eggs	4 teaspoonfuls baking powder
2 cupfuls sugar	1 teaspoonful vanilla
1 cupful milk	$\frac{1}{2}$ cupful butter
$2\frac{1}{2}$ cupfuls flour	$\frac{1}{2}$ cupful (2 squares, or 2 ounces) grated chocolate, melted

Mix the ingredients by method I or II, putting them together in the order in which they are given.

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Chocolate cake without eggs

3 squares (3 ounces) chocolate	1 cupful sour milk
$\frac{1}{2}$ cupful sugar	2 cupfuls flour
$\frac{1}{2}$ cupful sweet milk	1 teaspoonful soda
1 cupful sugar	$\frac{1}{2}$ teaspoonful salt
$\frac{3}{4}$ cupful shortening	$\frac{1}{2}$ teaspoonful vanilla or

$\frac{1}{2}$ teaspoonful ground cloves

Cook together the chocolate, one half cupful of the sugar, and the sweet milk until the mixture is thick. Add the remaining cupful of sugar, sour milk which has been mixed with the soda, flour, salt, and shortening.

Potato chocolate cake

4 eggs	$3\frac{1}{2}$ teaspoonfuls baking powder
2 cupfuls sugar	2 squares chocolate, melted
1 cupful hot mashed potatoes	$\frac{2}{3}$ cupful shortening
$\frac{1}{2}$ cupful milk	1 teaspoonful cinnamon
2 cupfuls flour	$\frac{1}{2}$ teaspoonful cloves
1 cupful chopped nut meats	1 teaspoonful grated nutmeg

Mix the ingredients by method II. This recipe makes two loaves of cake that can be kept moist for some time.

SUGAR COOKERY

Boiled frosting is one of the most popular as well as the most delicious of all cake frostings. To be successful in making it, however, requires a certain amount of care and a knowledge of some of the essential points in sugar cookery. Many otherwise delicious cakes are spoiled by the addition of unsuccessful frostings, and because of these failures many housewives hesitate to attempt the making of boiled frostings. Therefore

in order to encourage housewives in this kind of cookery as well as to guard them against failure when trying some of the recipes for frostings and fillings given in this lesson, the following points essential to a thorough knowledge of sugar cookery are given.

Certain properties of cane sugar

The ordinary sugar of commerce is known as cane sugar. This name was originally given to indicate the source from which the sugar was made, but it is now used instead to distinguish cane sugar from other sugars, such as glucose, maltose, lactose, and the like, and may refer to sugar produced from either sugar cane or sugar beets. Cane sugar possesses properties that differ greatly from those possessed by glucose.

1. Cane sugar crystallizes readily and in large crystals from a concentrated cane sugar solution. Glucose is crystallized with great difficulty and the crystals formed from a concentrated glucose solution are extremely fine.

2. The presence of glucose in a cane sugar solution prevents or retards crystallization and decidedly modifies the kind of crystals formed. When sufficient glucose is added to a concentrated cane sugar solution and the solution is made to crystallize, instead of the large cane sugar crystals, very fine crystals are formed and the mixture has a creamy consistency. This fact is fundamental to the making of certain frostings and candies.

3. When cane sugar is cooked with an acid, it is gradually changed to glucose and fructose. The amount of glucose and fructose produced depends on the amount of acid used and the length of time required to concentrate the solution.

Relation of temperature to concentration in sugar cookery

Sugar cookery means the process of concentrating a sugar solution. When sugar and water are cooked together the mixture becomes thicker, or more concentrated, in proportion to the amount of time the mixture is cooked. There is a very interesting relationship between the concentration of a sugar solution by heat and the temperature of the solution. *At a given concentration a sugar solution always has the same temperature.* A fact of equal value in sugar cookery is the reverse of the last statement; that is, *at a given temperature a sugar solution in process of cooking always has the same concentration.* These facts make the use of a thermometer that can register high temperatures of great value in making cooked frostings and candy. It is possible by using a thermometer to know the exact concentration of a sugar solution. It is also possible by testing the concentration of a sugar solution to know about what the tem-

perature is. The following tests will help the housekeeper in obtaining accurate results when cooking a sugar solution with or without the use of a thermometer.

1. *Soft ball stage.*— If a sugar solution is cooked until the thermometer registers a temperature of 234° F. to 242° F., the concentration will be such that a little of the sirup poured into cold water will form a ball that holds its shape under water but that loses its shape when lifted from water.[5] This is called the soft ball stage of concentration and this is the degree of concentration used for cooking almost all boiled frostings and for such candies as fudge, panocha, and fondant. Another test for this stage is that the sirup begins to thread when some of it is dropped from the tines of a fork.

2. *Hard ball stage.*— A temperature of 246° F. to 250° F. in cooking a sugar solution gives a sirup sufficiently concentrated to form a ball that is firm under cold water and that still holds its shape when lifted from the water. This is known as the hard ball stage.

3. *Soft crack stage.*— When a sugar solution in process of cooking reaches a temperature of 290° F., the sirup is sufficiently concentrated to form small balls or threads that will snap when kept under cold water but that lose their brittle quality when removed from the water. This is called the soft crack stage.

4. *Hard crack stage.*— A temperature of 310° F. in a sugar solution gives a sirup sufficiently concentrated to form balls or strings that snap when held under cold water and that retain their brittleness when removed from the water. This is called the hard crack stage, and a sugar solution cooked to this degree is used for coating nuts and in making candies such as peanut brittle.

5. *Caramel stage.*— When a sugar solution reaches a temperature of 350° F., the sirup turns brown, loses its power of crystallization, and develops a peculiar agreeable flavor. This substance is known as caramel. The presence of caramel in a cane sugar solution helps to retard or prevent crystallization and when the solution does crystallize it has a creamy consistency. Caramel is frequently added to sugar solutions for flavoring and in order to influence crystallization. It is also used in other foods, such as soups and desserts, for flavoring and in order to give color. After sugar has been caramelized, it will harden into a brittle mass and it may be used in that form or may be dissolved in a small amount of water and bottled ready for use.

6. *Carbonizing stage.*— If a sugar solution is cooked beyond the temperature of 350° F., it begins to decompose, or carbonize.

[5] Fahrenheit temperatures may be changed to centigrade by using the following formula: Fahrenheit temperature — 32 x $\frac{5}{9}$ = centigrade temperature.

Use of acids and glucose in sugar cookery

If a cane sugar solution is cooked with an acid, such as lemon juice, cream of tartar, sour milk, or vinegar, the cane sugar is gradually changed to glucose and fructose. If there is a sufficient amount of acid or if the cooking is continued for a sufficiently long time, all the cane sugar will be changed to glucose and fructose. Glucose is only about three fifths as sweet as cane sugar, and, as has been said before, it is very difficult to crystallize glucose and the crystals that form are very fine. Its presence in a cane sugar solution, therefore, modifies the type of crystallization that takes place when the solution is cooked, and decreases the sweetness of the solution. Acids are used in making candy and in making frosting because of their effect in producing glucose. Very small quantities of acids are used because there is a limit to the amount of glucose desired and because they affect the flavor of the mixture. If too much glucose is produced in a sugar solution, a sticky mixture results instead of a creamy one. Instead of cooking a cane sugar solution with acid in order to produce glucose, glucose may be purchased as such and may be added directly to the sugar mixture. This is the common practice in making candy on a large scale. Acid impurities in some grades of sugar cause the change from cane sugar to glucose. In making candy and frosting from brown sugar no acid need be added, since the sugar contains sufficient acid impurities to aid in producing glucose.

Effects of premature formation of crystals in a sugar solution

If crystals are allowed to collect on the sides of the pan while a cane sugar solution is cooking, they may cause a coarse recrystallization of the mass. These crystals, therefore, should be kept washed down with a wet cloth or a small wet brush. If the pan in which the sugar solution is cooking is covered for the first part of the cooking period (about five minutes), sugar crystals are not likely to form in any quantity on the sides of the pan. The steam formed by the boiling of the solution will dissolve any such crystals.

Method of reducing an overcooked sugar solution

Success in sugar cookery depends on the ability of a person to cook a sugar solution to the proper degree of concentration for the use that is to be made of it. Sometimes in cooking a sugar solution for frosting cake it becomes overcooked, or, in other words, it becomes too concentrated. If the sugar mixture has not reached the caramel stage, it is a simple process to reduce the amount of concentration by adding more

water. Good results may not always be obtained, however, by this method, for the addition of more water makes it necessary to prolong the time of cooking the solution and that in turn means a continuation of the action of any acid that may have been used and an increased production of glucose. In most cases, however, only enough glucose has been produced in this way to effect the desired crystallization.

SELECTED AND TESTED RECIPES FOR FROSTINGS AND FILLINGS

Any kind of work is materially aided by the use of the proper kind of tools for that work. Therefore, a list of the utensils that have been found to be most suitable in making frostings and fillings for cake are given here.

A smooth aluminum or granite-ware dish with a handle is the best kind to use in cooking a sugar solution. A dish that is deep enough to hold a candy thermometer is better than a broad, shallow dish, because, during the last stages of boiling, the sirup may be watched more closely and the changes in its concentration are not so rapid as in a shallow dish. Besides the usual measuring cup, stirring spoon, round-bottomed bowl, and dover egg beater, a double boiler, a spatula, a small brush with which to wash down the sides of the pan, and a candy thermometer are useful. The thermometer may be dispensed with, but its use saves much trouble in testing the frosting. A copper-hooded candy thermometer that will be found sufficiently accurate for household use may be purchased for seventy-five cents.

Boiled frosting

In making boiled frosting, just as in making cake, it is possible to vary the amounts of ingredients used in proportion to the time of cooking. There are three ingredients essential to the making of any so-called boiled frosting, water, sugar, and white of egg. Cream of tartar may be used with good effect, for it gives the frosting a creamy consistency, but if none is at hand the same effect may be produced by substituting vinegar or by increasing the amount of water and thus prolonging the time of cooking. When the amount of white of egg used in a recipe is increased, the temperature to which the sugar solution is cooked should be increased. The following are three recipes for making boiled frosting. Any one of the three methods given may be followed in using these recipes.

Recipe I

1 cupful sugar	$\frac{1}{16}$ teaspoonful cream of tartar
$\frac{1}{2}$ cupful water	White 1 egg

This is the old standard recipe and it makes a rather dense, sweet frosting. The sugar solution should be cooked to 238° F., the soft ball stage.

Recipe II

1 cupful sugar	$\frac{1}{16}$ teaspoonful cream of tartar
$\frac{1}{2}$ cupful water	Whites of 2 eggs

This recipe makes a fluffy frosting. The sugar solution should be cooked to a temperature of 244° F., the beginning of the hard ball stage, because of the increased amount of white of egg used.

Recipe III

1 cupful sugar	$\frac{1}{16}$ teaspoonful cream of tartar
$\frac{1}{2}$ cupful water	$\frac{1}{6}$ cupful white of egg

This recipe for boiled frosting is the best one to use because it calls for the careful measurement of all ingredients, including the white of egg. Eggs vary in size and when they are used in making frosting this variation may make the difference of success or failure of the frosting. By measuring, all inaccuracy can be avoided. This recipe will make enough frosting for the top of a cake about nine inches in diameter. The amount of frosting desired may be easily increased or diminished by taking the amount of sugar as a basis. Use one half as much water as sugar, one sixteenth of a teaspoonful of cream of tartar to a cupful of sugar, one sixth as much white of egg as sugar.

Any one of the three following methods of making boiled frosting may be used with any one of the three recipes already given.

Method I

Dissolve the sugar and cream of tartar in the water. If one egg is to be used, let the sugar mixture boil until it reaches the soft ball stage (238° F.), or until it forms threads when some of it is dropped from the tines of a fork. If two eggs are to be used, boil the sugar mixture until it reaches a higher temperature, about 244° F., the hard ball stage. Do not move the dish or stir the sirup during this period of cooking. Cover the pan during the first few minutes that the sugar solution is boiling, so that steam may collect on the sides of the pan. This will help to prevent the formation of large crystals that would cause the sirup to crystallize in coarse grains and that would spoil the texture of the frosting. After removing the cover of the pan, insert the candy thermometer and wash from the sides of the pan any crystals that may form, using a brush or cloth that has been wet with cold water. When the sirup is cooked, pour it slowly on the beaten white of the egg, using the dover egg beater and beating continually while pouring. Continue beating until the frosting is cooled and is stiff enough to

spread on the cake and remain in place. If the mixture does not thicken properly it may be cooked again by method III, twice-cooked frosting.

Method II

Melt the sugar in the water, add the cream of tartar, and boil the mixture, following carefully the directions given under method I for making boiled frosting. As soon as the sirup boils, begin to add it slowly, a tablespoonful at a time, to the stiffly beaten white of egg, beating vigorously after the addition of each tablespoonful of sirup. Continue to add the sirup in this manner until about half of it has been used, and the white of egg is very light and frothy. Cook the remainder of the sirup to the hard ball stage (246° F.). Wash down the sides of the pan with a brush whenever it becomes necessary. Add this sirup gradually to the mixture of eggs and sirup already made, beating continually with a dover egg beater until the frosting is stiff enough to spread on the cake and remain in place. If the frosting proves to be too thin, put it in a double boiler, stir constantly, and cook the mixture until it rises. This indicates that the white of egg is cooked, and it should be removed from the fire at once. After the frosting has cooled, it should be thick enough to spread and should have the proper consistency.

Method III

Melt the sugar in the water and boil the mixture without stirring until it reaches the hard ball stage (246° F.), or until the sirup when dropped from a spoon will form a long thread with short threads branching from the main one. Remove the sirup carefully from the fire and allow it to cool while the whites of the eggs are being beaten until they are stiff and dry. They should be beaten in the upper part of the double boiler, as this will save utensils, materials, and time. Pour the sirup slowly over the beaten whites of the eggs, beating the mixture as long as possible with a dover egg beater and after that with a spoon, until the mixture is light and stiff. Set the dish containing the frosting over hot water and allow the mixture to cook. Beat the mixture constantly until it is light and fluffy, rises slightly in the pan, and as it is stirred begins to give a slight scraping sound against the sides of the dish. This scraping sound may be learned only through experience, but it is easily detected. Remove the dish of frosting at once from the hot water. If the frosting is cooked too long over the hot water it will be granular. The frosting will probably be stiff enough to spread at once, if it is not, stir it until it has reached the proper consistency. This frosting may be piled on a cake to any desired thickness, or it may be used in a tube to make ornamental frosting. When it is properly made this frosting will be very light, fine grained, soft, and springy. After it

has been spread on a cake, it will form a thin crust on top and will keep moist and soft underneath for several days. This method makes a frosting known as twice-cooked frosting.

Twice-cooked frosting may be varied by allowing a thin layer of melted sweet chocolate to flow over the top of the frosting after it has been spread on the cake and a thin crust has formed on the top. The cake should then be cut with a thin-bladed knife that has been wet in boiling water. Twice-cooked frosting may be made from brown sugar or maple sugar as well as from white sugar and when these sugars are used the sirup should be cooked to a slightly higher temperature.

Other variations of boiled frosting may be made in the following ways:

1. Brown sugar may be substituted for white sugar. When brown sugar is used, the sirup must be boiled to a higher temperature (240° F.) before the mixture will reach the soft ball stage.

2. Use $\frac{1}{4}$ cupful of dark-colored strained honey and $\frac{3}{4}$ cupful of granulated sugar, or use $\frac{1}{2}$ cupful light-colored strained honey and $\frac{1}{2}$ cupful granulated sugar. Add 3 tablespoonfuls of water and boil the mixture until it reaches the soft ball stage (240° F.), or until it begins to form threads when some of it is dropped from the tines of a fork. Add the sirup to the white of egg in the manner described in method I. This frosting stiffens but does not grain, and should be spread on the cake immediately before using.

3. Freshly grated coconut may be liberally sprinkled on the top of a cake immediately after the frosting has been spread on it.

4. Chocolate frosting may be made by recipe I for boiled frosting by adding 2 squares (2 ounces) of chocolate to the sugar and water mixture before it has been cooked. The directions given under method I may be followed. Another method is to add melted chocolate to the white frosting after it has been beaten and is stiff enough to spread. The amount of chocolate may be varied to suit the individual taste.

5. One half cupful of chopped nuts, figs, raisins, dates, or any combination of nuts and these fruits, may be added to the frosting just before spreading it on cake.

In frosting a layer cake, it has been found helpful to pin a strip of glazed paper about an inch higher than the cake around it. This will serve as a retainer when the frosting is poured on the cake. After the frosting has set, remove the strip of paper, using a thin-bladed knife that has been wet in hot water.

Marshmallow frosting

$1\frac{1}{4}$ cupful brown sugar	White of 1 egg
$\frac{1}{4}$ cupful water	$\frac{1}{2}$ pound marshmallows

Follow the directions given under method I for making boiled frosting. Before the frosting cools, add the marshmallows that have been partially melted over hot water. This frosting may be made in another way, omitting the white of egg. Cook the sugar and water together until the sirup reaches a temperature of 230° F. Pour this sirup over the partially melted marshmallows and beat the mixture until it is cool. The frosting is then ready to spread on the cake.

Caramel frosting

$1\frac{1}{2}$ cupful light brown sugar	3 tablespoonfuls butter
$\frac{1}{2}$ cupful cream	$\frac{1}{2}$ teaspoonful vanilla

Boil the sugar, cream, and butter together until the sirup will form a very soft ball in cold water (234° to 236° F.). In a rather deep dish this will take about fifteen minutes. Remove the mixture from the fire and beat it until cool. Add the flavoring and spread the frosting on the cake quickly. One half cupful sweet milk or $\frac{1}{4}$ cupful of evaporated or condensed milk may be used instead of cream in making this frosting.

For chocolate frosting add 2 squares of chocolate, which have been grated, to the sugar solution before it is cooked.

For nut fudge frosting or for coconut fudge frosting, add chopped nuts or grated coconut to caramel frosting just before it is ready to put on the cake. Raisins may also be added at this time or marshmallows cut in pieces.

Mocha cream

$\frac{3}{4}$ cupful butter	$2\frac{1}{2}$ cupfuls confectioners', or
1 to 2 tablespoonfuls coffee essence	XXXX, sugar

Cream the butter, add the sugar gradually, and beat until the mixture is smooth and creamy. It will also be somewhat light and fluffy in appearance. Flavor this mixture to suit the taste with essence of coffee that has been made by cooking one part coffee with three parts water for about ten minutes and draining off the liquid. If the mixture is inclined to curdle when the coffee is added, the coffee essence is too weak. When finished the frosting should be a light straw color. It will not spread smoothly on the cake. It is delicious, quickly made, and it can be kept in a cool place for an indefinite time before using on cake.

Chocolate mocha cream

Use the recipe and method given for making mocha cream. During the last moments of beating the mixture, add two squares of chocolate which have been melted. If the coffee flavor is not desired, the coffee essence may be omitted, and one teaspoonful of vanilla used instead.

Orange frosting

2 tablespoonfuls orange juice, part of orange peel (grated), confectioners', or xxxx, sugar

Mix the orange juice and grated orange peel together, add confectioners', or xxxx, sugar until the mixture is thick enough to spread on cake.

Jelly coconut frosting

Spread the top of cup cakes with slightly melted fruit-juice jelly, and while it is still warm, sprinkle grated coconut on the jelly.

Pineapple filling

1 cupful grated pineapple	2 tablespoonfuls lemon juice
1 tablespoonful grated orange peel	Confectioners', or xxxx, sugar

Mix the pineapple, fruit juice, and orange peel together. Add enough confectioners' sugar to make the mixture the right consistency to spread on cake.

Chocolate cream filling

$\frac{7}{8}$ cupful sugar	2 cupfuls scalded milk
$\frac{1}{3}$ cupful (6 tablespoonfuls) flour	2 ounces chocolate
$\frac{1}{8}$ teaspoonful salt	1 teaspoonful vanilla

Yolks 2 eggs

Mix the dry ingredients, including the chocolate which has been grated, add the yolks of eggs slightly beaten, and add this mixture gradually to the scalded milk. Cook the mixture for fifteen minutes in a double boiler, stirring it constantly until it is thickened, and after that stirring it occasionally. Cool the mixture and flavor it with the vanilla. The filling is then ready to spread on cake.

Plain cream filling

This may be made by the same recipe and method used in making chocolate cream filling except that the chocolate is omitted.

Coffee cream filling

Use the same recipe and method given under chocolate cream filling, substituting, however, $1\frac{3}{4}$ cupful coffee in place of the milk called for in the recipe, and omitting the chocolate.

Coconut cream filling

Add $\frac{1}{2}$ to $\frac{3}{4}$ cupful of grated coconut to chocolate cream filling made by the recipe and method given on the preceding page. The filling should be cool before the coconut is added. The chocolate may be omitted, and if this is done, use $\frac{1}{2}$ instead of $\frac{1}{3}$ cupful flour. When the cake, put together with the filling, is to be used immediately, the filling may be varied by omitting the chocolate and coconut and adding sliced ripe bananas to the filling after it has been thoroughly cooled.

Fig filling

$\frac{1}{2}$ pound chopped figs	$\frac{1}{3}$ cupful boiling water
$\frac{1}{3}$ cupful sugar	1 tablespoonful lemon juice

Mix the ingredients in the order in which they are given in the recipe. Cook the mixture until it is thick enough to spread on cake.

This recipe may be varied by substituting an equal quantity of raisins for part of the figs, and by adding $\frac{1}{4}$ cupful of chopped nut meats.

FANNIE MERRITT FARMER

Apple-butter and nut filling

$\frac{1}{2}$ cupful chopped nut meats	$\frac{3}{4}$ cupful apple butter

Stir the nut meats into the apple butter and sweeten the mixture if it is necessary. This filling is especially good for winter use. Lightning cake made by the recipe given on page 1462 of this lesson is delicious when baked in two layers and put together with this filling.

Orange filling

$\frac{1}{2}$ cupful sugar	1 tablespoonful lemon juice
3 tablespoonfuls flour	Grated rind 1 orange
$\frac{1}{2}$ cupful water	1 egg
$\frac{1}{4}$ cupful orange juice	1 teaspoonful butter

Mix together the dry ingredients, add the egg which has been slightly beaten, the orange peel, water, and fruit juice. Cook the mixture for ten minutes in a double boiler, stirring it constantly. Remove from the

fire and add the butter. After the filling has cooled it is ready to spread between layers of cake.

Lemon filling

1 cupful sugar	$\frac{1}{4}$ cupful lemon juice
$2\frac{1}{2}$ tablespoonfuls flour	1 egg
Grated rind 2 lemons	1 teaspoonful butter

Mix together the dry ingredients, add the lemon juice and egg which has been slightly beaten. Cook the mixture in a double boiler for ten minutes, remove it from the fire, and add the butter.

FANNIE MERRITT FARMER

Fruit and nut filling for Lady Baltimore cake

3 cupfuls sugar	1 cupful raisins, seeded and chopped
1 cupful water	1 cupful pecan meats, chopped
Whites 3 eggs	5 figs, cut in strips

Boil the sugar and water together until the sirup reaches the soft ball stage (238° F.), or until it forms a thread when some of it is dropped from the tines of a fork. Pour the sirup gradually into the whites of the eggs, which have been beaten stiff. During this process beat the mixture constantly. Continue beating until the mixture is of the right consistency to spread; then add the raisins, nut meats, and figs. Spread this filling between the layers and on the top of the cake and cover the top with twice-cooked frosting. One half of the quantity of this recipe may be made, and the filling put between the layers of the cake only.

FANNIE MERRITT FARMER

Filling for Lord Baltimore cake

3 cupfuls sugar	$\frac{1}{4}$ cupful blanched almonds, chopped
1 cupful water	12 candied cherries
Whites 2 eggs	$\frac{1}{4}$ teaspoonful orange extract
$\frac{1}{2}$ cupful rolled dry macaroons	2 teaspoonfuls lemon juice
$\frac{1}{4}$ cupful pecan meats, chopped	

Follow the directions given for making filling for Lady Baltimore cake. The lemon juice and orange extract should be added to the sugar solution before it is cooked. Spread the filling between the layers of the cake and frost the top layer with twice-cooked frosting as suggested in the preceding recipe.

TABLE OF WEIGHTS AND MEASURES

2 tablespoonfuls butter	1 ounce
1 cupful butter	½ pound
2 cupfuls granulated sugar	1 pound
4 cupfuls pastry flour	1 pound
16 tablespoonfuls	1 cupful
3 teaspoonfuls	1 tablespoonful

SUGGESTIONS FOR A CAKE CONTEST

Within the last few years there has been a greatly increased appreciation of the value of contests between individuals and organizations engaged in many kinds of work. This is especially true of rural communities where the corn clubs for the boys and canning clubs for the girls have become exceedingly popular. The idea of a cake contest is not a new one but the following rules have been used with success by the Department of Home Economics at the State College of Agriculture and they are here offered as suggestions.

1. Each competitor must bring two loaves of cake made from any two of the formulas given in this lesson. One of these cakes must be made from cake formula No. II and may be a modification of that formula.

2. Only the formulas given in this lesson shall be used. The competitor must state which formula has been used and any modification she has made in the formula.

3. The cakes must be baked in tins of uniform size and the measurements made by cups of uniform capacity.

4. Two cupfuls of batter must be the amount baked in each tin. One half of each recipe will be sufficient to make at least two cupfuls of batter. Any batter left over may be baked in muffin tins and need not be wasted.

5. If possible, the cakes must be made on the day before the contest. Cakes should be submitted the day after baking.

Cake formulas to be used in contest

Amounts of Various Ingredients Used

Number of cake formula	Flour (cupfuls)	Sugar (cupfuls)	Fat (cupfuls)	Number of eggs	Liquid (cupfuls)	Baking powder (teaspoonfuls)	Salt (teaspoonfuls)
No. I	3	1⅘	¼	1	1½	6–5	½
No. II	3	1⅘	½	2–3	1	5–4	⅓
No. III	3	1⅘	¾	3–4	¾	4–3	¼
No. IV	3	1⅘	1	5–6	½	3–2	⅕

Characteristics a cake should possess

1. *The flavor and odor* should be sweet, free from taste or smell of poor and strong-flavored ingredients.

2. *The texture* must be judged for grain, lightness, moisture, and tenderness. The grain should be even and fine. The richer a cake is, the finer the grain will be. Lightness means that the cake should not be heavy in spots due to lack of thoroughness in mixing and carelessness in baking. The correct amount of moisture in a cake means that it be free from doughiness or staleness. A cake should be tender, breaking easily without crumbling. It should not be bready.

3. *The shape* should be symmetrical, not noticeably higher on one side or in the middle.

4. *The crust* should be light golden brown in color, thin and even over the entire surface of the cake, not gummy or sticky in texture, and easy to break.

Score card for cake

In scoring the cakes submitted in the contest the following credits should be given for a perfect loaf:

1. Crumb	flavor		15
	odor		5
	texture	grain	10
		lightness	20
		moisture	10
		tenderness	10
2. Loaf (shape)			10
3. Crust	color		5
	depth		5
	texture		5
	tenderness		5
Perfect score			100

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

Entered as second-class matter at the post office at Ithaca, New York

B. T. GALLOWAY, *Director* A. R. MANN, *General Editor*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

VOL. IV. No. 75 NOVEMBER 1, 1914 FOOD SERIES No. 13

MAKING CAKE.— PART II

DISCUSSION PAPER

By means of the discussion papers we have an opportunity to become acquainted. We shall take it as an indication on your part that you are interested if you answer the questions and return them to us. The staff of the Department of Home Economics is ready to assist in your study of scientific home-making. We want your assistance as well. Ask questions, offer suggestions, let us have the benefit of your experience. You thus become a vital part of the Department of Home Economics in its efforts for scientific housekeeping.

Will you please send your opinions on the following points to the Supervisor of the Cornell Reading-Course for the Farm Home?

1. Under what conditions is cake a wholesome part of the dietary?

2. Is cake an expensive form of food? Give reasons.

3. Experiment with one of the formulas for making cake given in Parts I and II of this lesson and describe your results.

4. If you should hold a cake contest in your community tell us of your results.

Name..

Address..

Date..

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VOL. IV. No. 77 DECEMBER 1, 1914 RURAL LIFE SERIES No. 10

SONGS THAT LIVE

ROSE MORGAN

The child who grown old finds himself in possession of the blest traditions and memories of the places and things of his childhood, enjoys a legacy whose worth increases with the years, whose meaning unfolds with life. Probably there is no form of early home influence more enduring than the home song; and its power is continuous in proportion to the place it occupied in that early home influence. The home song, therefore, should be fundamentally a thing of truth. It should not be the woven tinsel of fancy and sentimentality, but it should be composed of words and melody that are coined from the heart's pure gold. Such a song lives. There are few homes in this State where a good song, if once it became installed, would not be appreciated, and there is no home that would willfully cancel or lose the power of that song as a memory-maker and as a character-builder. Unworthy songs have crept in not because our home-making hearts are wrong but because our home-making heads and hands are so full of the work of the insistent present and the foreshadowing future that we do not often stop to weigh the values in songs as in other things.

We believe the song to be a character-making force. We believe that there are better songs for the country school, the grange, and the occasional country-life program than are ordinarily used in them. We believe that there are better hymns for the country church and Sunday school services. We believe, and it is this phase of the question we wish to deal with especially, that the home is the natural center of that power for good which we rest in song, and that there are better songs for it than the average home of to-day provides.

Already work has begun to meet the problem, which our weighing of the values has revealed to us, touching song in the home. The conclusion that the country home should, and can, and will, make a radical change in the character of its songs is being reached by the consent and cooperation of fathers, mothers, teachers, preachers, and others who are vitally interested. These men and women are working to the end that the

country home shall be clean of the "praise that cannot purify," of the passing lilt wherein life's sacred relations are made a joke, of the song that cannot possibly bring a sweet home-memory in the after years to the children who have gone out from the home.

This subject of songs for the home has been discussed in country-life conferences, institutes, extension schools, and at Farmers' Week at the State College of Agriculture. The speakers at these meetings have tried first of all to impress upon their audiences the hold that trashy popular songs have gained in homes. At the close of a recent conference a New York State mother called attention to the March (1913) issue of the *Woman's World*, through whose columns Mr. George Weston has made a strong appeal to the makers of homes for their support in a demand for better songs. Read what Mr. Weston has to say of trashy songs. It is a just attack, and having read or re-read what we here quote from it, it may be that you will wish to go through the words of the songs that have collected about your organs and pianos so that you may be certain of what really constitutes your home songs. It may be that in these days when there are many worthless new songs in comparison with the few that are worthy, some latest hit entirely foreign to the tone of true home songs may have intruded itself.

Mr. Weston says:

Without a doubt it may be accepted that songs have a deep influence upon mankind. This influence should always be for good. But we sometimes, indeed in these days often, find it working for evil. The latter reflection is aroused by the shocking decline which has recently taken place in American song writing. Think of the tender humanity in that old favorite, *My Old Kentucky Home*. And then think of such near-filth as *Oh You Beautiful Doll* and those similar outbursts which stand at the head of our popular songs to-day. Truly, 'the old order changeth.'

Let us consider, for a moment, what a wonderful thing is the spread of a popular song. Suppose the president of the nation rises to-day and, dealing with a subject of vital influence to our welfare, speaks a few sentences of wisdom. How many would be able to repeat his words a month hence? Would a thousand men have them stored away in memory? But suppose that a catchy popular song is launched, with some such refrain as

'Polly Wolly used to work
But she's too wise now!'

In a few short months it will be known by millions. It is interesting to trace the popular song to its lair and to see its effect.

It is the home which is the final lair of the popular song. The piano, the cabinet organ, the talking machine, and every other musical instrument call for the popular song. It needs only a short memory to recollect the time when such a call was answered by songs like *Kathleen Mavourneen*, *Believe Me If All Those Endearing Young Charms*, or *In Days of Old*. Now, however, if your daughter is entertaining a caller they no longer sing such simple songs. Listen and you will hear them shouting: *Put Your Arms Around Me Honey*, or *Cuddle Up Closer*, or some similar erotic syncopation. Moreover, it isn't necessarily your daughter's 'steady' young man who is singing these songs with her. It's any young man. And their only excuse for singing such stuff is that they're the latest popular successes. Songs of romance have changed to lyrics of license, and virtue finds itself assailed in its last retreat.

Let us go back a long, long way and ask ourselves how people ever started to sing, and why they go on singing. In its purest sense, song is a mode of expression used

when the spirit of life is so stirred that it bursts from the confines of ordinary speech and rises into harmony. Speech was born of the mind, but song is a child of the spirit. Then what a pity, when we ought to be rejoicing and uplifting our souls in song, to find that the wells of harmony are being polluted with a moral poison. We search for reasons. Why are such songs sung? For the slightest and yet for the strongest of reasons. Why does a bride wear a veil? And why does a man have lapels on his coat? Because such things are the style. So, too, with suggestive ragtime songs. They're the style, the latest popular successes. If you don't know them, you're not up to date. It is a mournful commentary upon public manners that our sons and daughters must be in touch with filth in order to be up to date. But it isn't only a mournful commentary. It is a fact. And, as a fact, it's a thing to be faced.

It is true that most of the cheap and vicious songs originate in cities, but all too quickly they find their way into rural communities and homes. During the last two years many persons have gone over the matter together, have given testimony, and have compared conditions and experiences. From data that have been collected it has been found that for some reason it is true that to-day the young people in the country homes are almost or quite as much exposed to the blight and contamination of trashy and filthy songs as if their homes were not aloof from and independent of the sources and sites of such songs. The reason for this has been searched for and has been found. Mr. Weston stated it in the part of his article that was quoted. Dr. L. H. Bailey stated it when he once said in speaking to us of the country that we "are in danger of a crying foolishness, that of the fear of not being up to date."

The "fear of not being up to date" in the matter of songs, and the eagerness to have country homes and boys and girls enjoy what purports to be created for the giving of pleasure as exploited in the city, has set country people to hasty and indiscriminate buying of "the latest" music. The unworthy type of city music has been adopted, and it has been called representative; the vast amount of worthy music that is heard at its perfection in the city has been temporarily forgotten. Think of the church music, the operas, symphonies, and oratorios, the concerts and recitals of high grade! Many of these musical entertainments are free to the public and are even organized to be carried free to every part of the city. Think of the great choral societies, the carefully taught music in high schools and graded schools, the chances for the best of training in every phase of music — all of which tends to shorten the life and the influence of the bad song in the city, even though its spread is universal.

Better songs in the country home is quietly becoming one of the working texts in many communities of this State. There is not only the desire on the part of people in rural communities to choose between the good and the bad in songs, but there is the ability when thought and care are given to the judging. As proof we are about to quote from letters written by men, women, and children, telling of their appreciation of the theme

of good songs; better yet, telling what is to be done in the particular home or community of the writer; best of all, telling what has been done. All reports of work begun quicken our appreciation of Dr. T. N. Carver's remarks made in opening his address before the Rural Community Interests Convention in New York City last winter:

"We all believe, of course, in religious work, Christian work. We all sing, 'Work, for the night is coming.' It seems to me if we could make that a little more pointed and instead of singing 'Work'— everybody wants to work, but does not know what to do first — say, 'Clean out these fence corners, for the night is coming,' 'Build better bridges and schoolhouses, for the night is coming,' we would get somewhere." "Sing better songs, for the night is coming" has added itself. The following extracts from letters that have been received recently seem a fulfillment of Doctor Carver's injunction to us regarding this phase of rural community interests:

Cuba, Allegany County

"We had a bonfire last night and we've mighty few songs left."

Canton, Saint Lawrence County

"There has been a general house cleaning with us and we were surprised to find how much musical rubbish had collected. It won't occur again."

Worcester, Otsego County

"Will you please send me a list of good victrola records, old and modern. I don't want the children to play the others any more."

Lockport, Niagara County

"I'm that one who was afraid of being known as an old fogy. The stuff is burned that I always knew ought to be."

Manlius, Onondaga County

"I mean that my little daughter shall have as good home songs as I was raised on."

Wallkill-on-Hudson, Ulster County

"I came away from Farmers' Week determined to use my influence for better music. I have 'begun at home.'"

Schuylerville, Saratoga County

"I don't think I've heard that song *Tombigbee River* since war days. Us G. A. R. boys need some good songs bad. I've been thinking up some old ones and we'd be obliged to you if you'd help us get hold of them."

Dansville, Livingston County

"We want to get rid of our jig tune Sunday school book and try to put one in that will live. What is good?"

Riverhead, Long Island

"Father used to forbid the 'rags' on Sunday and now my brother and I are sifting out the worst week-day ones. My father says what are left are good enough for Sunday."

When the trashy song secures a place in the country community, what is there with which to meet and annul its power for lowering the tone of life and the "blessedness of the country"? Perhaps there is a pastor and choir with appreciation of the value of good songs, perhaps there is a high grade music teacher or school teacher. It may be that the community has a patron saint who invests thought and time and patience and money to the end that good music shall meet and conquer the invading bad. The most effective influence for good in songs is the influence that emanates from the home, for it is lasting. The solution of the problem, however, rests largely with the individuals that make up each household. They may show their devotion to the high ideals of the country by refusing to buy, sing, or tolerate besmirching songs of the hour.

Suggestion is the birth of thought;
  Thought dwelt upon becomes action;
Action repeated becomes habit;
  Habit is character.

Because of the comparative isolation of the country home many desirable features of good home-making must come to it slowly. Its very isolation and independence make it the natural friend and advocate of the good song. Its open windows do not let in, perforce, the contaminating street song. Its doors can remain closed to the rap of a blighting "best seller" until the family within have taken time to pass upon the merits of that song, to discover whether or not it is in harmony with the family's aspiration to secure good things for itself, and whether it voices the family's spirit of independence in the obtaining of these things. Heretofore, the people of rural communities have hardly considered their responsibility in the setting of standards for good home and community songs. Now that the whole American people are waking — slowly, it is true! — to the question of good and bad songs for their homes, is it not reasonable that the country people should assume a strong leadership in the matter? Should they not be the ones to say what shall and what shall not constitute their home and community songs?

The meaning of a song is conveyed by the combined force of its words and its melody. In a good song the melody seems to give rise to the words and the words to the melody. Men naturally sing of what fills their heads and their hearts. The resulting song is good to the degree in which it suggests the good and the beautiful through its words or melody, or through both. A song is to be neither approved nor condemned because it is new. Nor should it be counted without merit if in actual use it seems to touch the hearts of young and old as it finds its way out into the world. But time and opportunity are as precious as they are fleeting; and what

family is there that can afford to rest its family traditions and future memories on songs of uncertain quality when good ones can be had?

FOUNDATION FOR THE MOVEMENT FOR GOOD SONGS

In order that the reader may know that the present movement for the betterment of songs for homes is not a new idea, the following quotations are given. These quotations are the thoughts of some well-known men and women who lived long enough before they spoke to realize that they were saying neither new nor startling things, but that they were speaking the belief of all and the experience of many.

The first of the quotations is from the preacher Phillips Brooks, who loved boys and girls and was loved by them:

> Much stress should be laid upon the fact that the youthful memory being exceedingly tenacious, impressions made upon the child are likely to be indelible. The great incidents in the history of the Israelites were woven into song, and these eucharistic epics were required to be diligently taught to their children. So, in the present day, the simple doctrines and thrilling events of Christianity should be wrought into verse and impressed upon the mind of the teacher by the power of music. Truths thus inculcated will cling to the soul forever. We all know that cherished memories of home and friends are ours with such enduring vividness that the record can never be effaced. But in all the reminiscences of days gone by there is nothing that so haunts the spirit as the songs to which we were accustomed in childhood. The sweet tones of a mother's voice will live and speak in the heart long after the voice has been hushed to silence. The recollection of the hymns which were first heard amid the throng of worshipers in the city, or in the embowered country church, may remain in morning freshness long after the sanctuary has mouldered into ruins. We may cross oceans, and wander in foreign climes; the erect frame may be bowed with the weight of years, and raven ringlets may be changed to locks of snowy whiteness; but the old home songs heard in the distance in the still morning, or sung by ourselves in some calm hour of reflection, or by the home-circle on a winter's evening, will bring around us the friends and the scenes of other days and of far-off lands; and while the dim eye of age sparkles with unwonted brilliancy, the heart will beat with the buoyancy of early youth. It is not at all improbable that the songs learned in the nursery, or around the fireside, will be used by the Holy Spirit in after years as a means of conversion to a better life, it may be our final salvation from endless ruin. On the contrary, bacchanalian or ribald songs, which are apt to be learned and used by those who are unaccustomed to religious melodies, are, in the hands of the Destroyer, a potent means of ruin. Shall we quietly allow this tremendous power to pass into the hands of the enemy, or shall we not eagerly seize upon it as our lawful right, and wield it for the good of our race and the glory of our God?

The second is from Henry Ward Beecher, the singing of whose congregation would have served as a model and inspiration to the country church:

> The tunes which burden our modern books, in hundreds and thousands, utterly devoid of character, without meaning or substance, may be sung a hundred times, and not a person in the congregation will remember them. There is nothing to remember. They are the very emptiness of fluent noise. But let a true tune be sung, and every person of sensibility, every person of feeling, every child even, is aroused and touched. The melody clings to them. On the way home snatches of it will be heard on this side and on that; and when the next Sabbath, the same song is heard, one after another of the people fall in, and the volume grows with each verse, until at length the song, breaking forth as a many-rilled stream from the hills, grows deeper and flows on, broad as a mighty river! Such tunes are never forgotten. They cling to us through our

whole life. We carry them with us upon our journey. We sing them in the forest. The workman follows the plow with sacred songs. Children catch them, and singing only for the joy it gives them now, are yet laying up for all their life food of the sweetest joy. Such tunes give new harmony and sweetness even to the hymns which float upon their current. And when some celestial hymn of Wesley or of the scarcely less than inspired Watts, is wafted upon such music, the soul is lifted up above all its ailments and rises into the very presence of God, with joys no longer unspeakable, though full of glory. In selecting music, we should not allow any fastidiousness of taste to set aside the lessons of experience. A tune which has always interested a congregation, which inspires the young, and lends to enthusiasm a fit expression, ought not to be set aside because it does not follow the reigning fashion or conform to the whims of technical science. There is such a thing as Pharisaism in music. Tunes may be faulty in structure, and yet convey a full-hearted current that will sweep out of the way the worthless, heartless trash whose only merit is a literal correctness. When a tune has been found to do good work, it should be used for what it does and can do.

The third is from Dr. P. P. Claxton, chief of the United States Bureau of Education:

Whatever has at any time appealed to the best emotions and moved the heart of a people must have for their children and their children's children, political, historical, and cultural value. This is especially true of folk tales and folk songs.

The fourth is from Frances E. Willard, "a national defender of the Nation's homes":

In the spring of 1863 two great armies encamped on either side of the Rappahannock River, one in blue and the other in gray. One evening as twilight fell, the bands of music on the Union side began to play their martial music, *The Star Spangled Banner* and *Rally Round the Flag;* and that challenge of music was taken up by those upon the other side, who responded with *The Bonnie Blue Flag* and *Away Down South in Dixie.* It was borne in upon the soul of a single soldier in one of those army bands to begin a sweeter and more tender air, and slowly, as he played it, they joined in a sort of chorus of all the instruments upon the Union side, until finally a great and mighty tide of harmony swelled up and down our army — *Home, Sweet Home.* When they had finished there was no challenge yonder, for every band upon that farther shore had taken up the lovely air, so attuned to all that is holiest and dearest, and one grand chorus of the two great hosts went up to God. When they had finished, from the boys in gray came a challenge, "Three cheers for home!" and as they went resounding through the skies from both sides of the river, "something upon the soldiers' cheeks washed off the stains of powder."

The fifth is by Mary Anderson, a great actress and a noble mother:

Listen to a bit of advice from a woman who has been as young as any of you, who is a mother now, and who would have thanked somebody if she had said the same to her at your age. If you have a voice, whether remarkable for strength or sweetness, or neither, strive to cultivate it. A woman who cannot sing is as a flower without perfume. I do not mean you must sing scales and trills by the hour; these notions have left me long ago. Learn operatic wonders, if you like, only be sure to learn them correctly; but they are easily forgotten, rest assured. Learn a hundred or more beautiful little ballads. Not the kind that take a town by storm and die out in one season, but real songs that never grow old, whose tunes are melody, and whose words are poetry. The years are coming when you will find that your joy and your love, your modesty and your pride, blend more sweetly as you sing *Annie Laurie* or *Within a Mile of Edinboro' Town* than in executing the most wonderful gymnastics with your vocal organs. In sorrow, too, some such song, with all the sweet memories of the past clinging about its tender notes, will call forth tears to ease an aching heart. And there may come a time when a weary little head lies on its mother's bosom; little eyelids are drooping, twilight is drawing about her — too early for a lamp, too early for any

but little folks to sleep; then it is that all the accomplishments of her girlhood are as nothing compared with one simple song that lulls a tired baby to sleep. There is something soothing to the child in the mother's voice at any time, and it instinctively loves the melody of a song; so, girls, while you can, think of the mine of wealth you may lay up for the children that may one day come with their smiles and their kisses to brighten the way.

The last is by the author and poet, Richard Le Gallienne, author of *An Old Country House.* This extract is from his *A Defense of Old Songs* (Harper's Magazine, December, 1912). Young men in the country may also defend old songs. The song life of the farm home that is about to be established can be made the best illustration of such defense. In Mr. Le Gallienne's article he tells us that he found a songbook on the piano in the Connecticut farmhouse where he was living:

The book itself is not old, being, in fact, a cheap paper-backed collection made comparatively recently, such as can be bought in any music-store; and it is, therefore, the more significant, for it is thus not merely reminiscent of the tastes of the past, but representative of the tastes of the present, too, as it bears witness also to the remarkable longevity of popular favorites. It would seem, indeed, that when a song possesses the peculiar kind of vitality to capture the popular heart or the popular fancy, it can never quite lose its hold; but, indeed, goes on strengthening it, generation after generation, by the cumulative power of association.

The fashions of human feeling change not, and though new forms of its expression naturally arise and have their hour, man in his realer moments is best pleased by those old forms, consecrated and endeared by familiar usage, the words he is most at home with, and the tunes he used to whistle when a boy. And it must be a "superior," sophisticated eye, indeed, that would not soften and fill as it glanced over the titles alone of the book of "home songs" that is before me as I write. Take the first dozen, just as they come:

Alice, Where Art Thou? Annie Laurie. Auld Lang Syne. Be Kind to the Loved Ones at Home. Ben Bolt. The Blue Bells of Scotland. The Blue Juniata. By the Sad Sea Waves. The Campbells are Coming. Come Back to Erin. Comin' Thro' the Rye. Darby and Joan.

What doors of memory fly open with each quaint old-fashioned name.

* * * * *Old Folks at Home,* the magnetism of the melody is undeniable, but consider, so to say, the emotional voltage of the mere subject-matter of the words. There is the advantage for the writer of popular songs. The very words he uses—"Home"—"Mother"—"Country"—are poems in themselves, traditionally charged with human feeling. They are things rather than words, conveying their meaning as directly, and awakening as immediate response, as a national flag. * * *

Yet man's feelings are crude, or at least strong and simple when he feels at all; and it is hard to imagine such a theme, say, as a man's love for his mother—perhaps the most favorite theme of these popular songs—treated otherwise than with the heartfelt directness of simple affection; though, doubtless, there are some who would consider that the proper way to treat a mother in art is Whistler's way, merely dispassionately, as a "study" or an "arrangement."

The world at large, however, has decided in favor of Eliza Cooke's method in *The Old Armchair.* "Reeking sentimentality! Maudlin emotionalism!" one can hear some one—our old sophomoric selves, maybe—exclaim; yet one may well ask how an excess of sentiment or emotion is possible on such a subject as a mother's memory, or what object could more naturally focus our wistful affection than an old chair in which a beloved mother so long has sat and now sits no more. Here surely is an occasion on which the human heart may let itself go in unrestrained simplicity of its sorrow, however naïve and unlettered in its expression.

Often we refer to the preacher, the teacher, and the author, as we have just done, for a formal answer to a question regarding the moral and

intellectual welfare of our homes. Often, too, that answer differs little in meaning from the one we have already made to ourselves. It helps, however, to clear our thinking and to add further conviction. Having read what these men and women said on the question of good songs, we feel quickened in our judgment as to the elements that combine to make a good song. We study the component factors; we apply to songs the tests that will bring an answer which shall represent our personal estimate of their worth; our power to judge grows; we become censors of our home songs.

TESTS TO BE APPLIED TO A SONG

Has it lived?

Though time is not an absolute test of a song, yet long life becomes a guarantee of its worth. The critics say that half a century should be asked of a song before it can be said to have lived. The maxims say " a good song is sung by more generations than its own," and " a song is good that sees a man through his lifetime."

Songs that have lived may be grouped in three classes, the folk song, the folk ballad, and the art song.

1. *The folk song.*— Louis Elson describes the folk song as the " wild brier rose of music springing up by the wayside of art, and coming into being without any care being lavished upon it, without the artificial aids of music; it represents the natural side of an art that has gradually become scientific." Folk songs are the outgrowth of experience and feeling on the part of persons whose names the world, which has kept the songs alive for years and centuries, may never have known. The special value of these songs is their quality of recording folk, racial, and national characteristics in the simplest of songs. " History is punctuated with folk song," Carlyle wrote.

2. *The folk ballad and the national song.*— There seems to be no hard and fast rules whereby folk songs and folk ballads may be distinguished. However, the folk ballad ordinarily records its authorship, and it tells its story with more attempt at verse and at melody. Unlike the folk song, it asks the world to yield to its spirit by joining in a refrain or chorus. Sir Hubert Parry tells us that the opposite of a pure folk-song is the song made with commercial intention out of " snippets of musical slang,"— he refers to the cheap song of the day. In between this song and the pure folk-song the folk ballad seems to have its place. Longfellow in speaking of ballads says:

> They are the gypsy children of song, born under green hedgerows, in the leafy lanes and bypaths of literature in the genial summer time, and many a life story is contained in the simple words of a favorite ballad. Nevertheless we seldom realize what lies beneath the surface of the words, when we hear some of the simple old songs of our

youth. Many of them, indeed, are more or less epitomized versions of incidents in their author's lives, thus accounting for the sympathetic interest they awaken. They contain, although in veiled form, that one " touch of nature that makes the whole world kin."

The folk ballad may call people to a lively sense of patriotism, and may remain the lilting narrative; or it may lend its tune to other words, or vice versa, and may develop into a serious national song. The national song, however, may be born as Professor Brander Matthews has said:

A national song is one of the things which, it would seem, cannot be made to order. No man has ever yet sat him down and taken up his pen and said, " I will write a national hymn," and composed either words or music which the nation was willing to take for its own. The making of the song of a people is a happy accident, not to be accomplished by taking thought. It must be the result of fiery feeling long confined, and suddenly finding vent in burning words or moving strains. Sometimes the heat and the pressure of emotion have been fierce enough and intense enough to call forth at once both words and music, and to weld them together indissolubly once and for all. Almost always the maker of the song does not suspect the abiding value of his work; he has wrought unconsciously, moved by a power within; he has written for immediate relief to himself, and with no thought of fame or the future; he has builded better than he knew. The great national lyric is the result of the conjunction of the hour and the man.

A national song of the kind Professor Matthews describes may properly take its place among art songs.

3. *The art song.*— This type of songs that have lived is spoken of as classic. Ordinarily the classic song is the combined work of the poet and the musician, the result of the skillful treatment of carefully chosen subject-matter. There are instances, however, of folk songs and ballads with authorship unknown or humble, being accepted as song-classics because of their artistic trueness to type and their simple beauty. The art song that time as well as art has marked with the stamp of worth has double value, the song's own beauty and its standardizing qualities for song-making.

Will it live?

We do not sing songs merely because they have lived. We sing as a mode of self-expression; and if the song that is new to our ears and possibly newly created answers us, we sing it with much the same right that we use in adopting the style of the hour in house-furnishing or in dress. There are few of us, however, who fail to appreciate that a song, by its very nature, is more a matter of the spirit than is dress, and singing a more permanent influence in the home than is house-furnishing. Yet we are careful to-day to teach ourselves that the home that is artistically furnished, however simply, has a moral advantage over the home that is filled with the useless and the unbeautiful; and that the latest fashions in dress may make of us caricatures of our real selves if in adopting these

styles we forget that clothing should indicate self-expression as well as conformity to mode. This second test of a song, "Will it live?" refers to the modern song and includes an answer to the question, "Are there no good popular songs?"

1. *The popular song.*— The vogue of the present day popular song is due to its "ragtime," pretty, often very pretty, and full of sprightliness and suggestion. The word-maker knows this and the suggestive rhythm of "ragtime" seems to be his license. The "ragtime" becomes the color, gaudy but attractive, when skillfully used; the words — what do they become in this song which is claiming a place in the home as expressing the spirit of that home? Study them, read them separated from the tune. You will know if that song be not the dime novel of music. Its very tune, pretty as it may seem with its tinkly rhythm, is bad because it suggests and supports words that should never have been printed, much less sold or sung.

Study again some of the songs and ballads that have lived. Many of them were at one time so-called popular songs and "best sellers." Why did not they, too, perish within the year of their birth? Read their words separated from their tunes. Now take the tunes and see if they were once popular merely because they tinkled; is there not something more there than the suggestion of a clog dance? Compare these century-old songs that were once "best sellers" with the popular songs of to-day that have crowded them out. The result of this comparison will be a thinning out of the songs on the organ or piano, and many of the latest hits will go to the flames at once.

2. *Other modern songs.*— The unworthy popular song, though threatening a defeat of our good sense and musical taste, does not claim the whole field of modern songs by any means. Do you know Ethelbert Nevins' melodies for Eugene Field's and James Whitcomb Riley's words? Do you know the songs of Coleridge Taylor and of MacDowell, of Cowen and Cowles and Buck and Homer and Denee, and of Mrs. Beach and Margaret Ruthven Lang and Carrie Jacobs Bond? These names are but a few from the list of modern song writers. Apply your songs-that-have-lived yardstick to their songs and discover how well you invested when you brought them, or the phonograph and victrola records of them, into your home. Get more of the songs by these writers along with the time-tried ones that "age has not withered nor custom made stale." Remember that modern songs whether popular, semi-classic, or classic, that merit the will-live stamp, will in time become songs that have lived. Remember, too, that we Americans are not always to be the people of a new country, bearing the more or less just jibes put upon us for not being able to sing a single American or national song through without

the text before our eyes. Use good-song standards, measure American songs by these standards, learn them, sing them. The country home, with its agricultural "backbone of the nation" to keep straight and to make use of, has a privilege and a duty to perform in the founding of a musical system that will bring credit to America from the nations that now choose to judge her by American "ragtime."

The test of personal possession

Has the song lived? Will the song live? In addition to these tests of a song there is a third, which we may call the test of personal possession. Does or will the song live for me, the individual? Has it a place in my life for reasons personal and of value to me? Has it had the power with me to suggest thought, action, habit, character? As a memory, does it leave me unashamed and glad to recall it? Is it a song by which I shall be happy to have my children remember their home? All these are questions that the test of personal possession applies to a song. Songs that can stand this test may be folk songs and folk ballads, the class of which Dr. Claxton spoke, or they may be the "old songs" defended by Richard Le Gallienne. To whatever class they may belong, they are our songs and we are quick to defend them, with or without the test proofs of their having lived for any one else than ourselves. They may be recent, but more than likely they are good songs to us because they are the songs of our early homes. They have stood the test of personal possession. These songs are the children's heritage.

A HERITAGE OF SONG

There is no life so well favored that it has no need of a heritage of home song. Few there be of that great family of persons whose childhood lies well in the past who do not consciously realize from such an inheritance. A very few songs may constitute their riches and these of little intrinsic merit, a mother's bedtime croon, a father's simple old hymn, a family chorus or glee, some favorite from old days that association has kept. Yet no price could buy this heritage of song.

The sons and daughters of other lands, seeking better opportunities for living for themselves and for their children, cross to the American shore. In New York State are to be found thousands of men, women, and children whose native land lies far away from this new home of their adoption. Many families that thus bravely began home-building in a strange country brought with them very little of this world's goods, yet not one came without a heritage of song as a gift to the community into whose life the members of that family went to become citizens. In

many instances we have heard the fathers and mothers in their farm homes,

> " Sing to their sons those melodies,
> Those songs their fathers sung."

How welcome such songs are with their age-long standards of loyalty and purity and truth! Songs that have lived years and centuries in the Old World because they sang of country, and home, and mother, and God, should go on living in the New World, singing of country, and home, and mother, and God. Richard of Saltoun said, " Let me write the songs of a nation and I care not who makes its laws." Sing the songs of the country whose blood you bring to America and you will help make the laws that must best govern song-making and song-singing in this " land of the free and home of the brave." If we are to become a music-loving nation, we must have American music; it must smack of our soil; it must embody the character and express the tendency and trend of American life; it must bear the marks of our weal and woe; it must show in strongly marked rhythms the effect of our developed and developing national energy; it must be the faithful interpreter of the true American.

Last year the December number of the Reading-Course for the Farm Home was entitled *The Christmas Festival,* and on the last page of the pamphlet were the music and words of the beautiful carol, *Silent Night, Holy Night.* It was sung around many Christmas firesides last year and it will be sung again this year. We want all of the readers of the Reading-Course for the Farm Home to sing on this Christmas Day. We want you to sing songs that have lived and that will live. Therefore we are devoting the remaining pages of this number to a program of songs for the home for Christmas Day. You will find included songs for the old and for the young, brave songs and tender songs, songs of the Christ child and of home and of native land. Add to these songs those that are particularly loved in your own home and let us all join in this Christmas festival of songs that live.

THE NATIONAL HYMN OF THE WESTERN HOMELAND

AMERICA

S. F. SMITH

THE SONG OF THE HOME FLAG

THE STAR SPANGLED BANNER

FRANCIS SCOTT KEY

A SONG OF AMERICAN PATRIOTISM

BATTLE HYMN OF THE REPUBLIC

JULIA WARD HOWE

A STORY OF YANKEE DOODLE

ANONYMOUS

6. With "Hail Columbia!" it is sung,
   In chorus full and hearty;
On land and main we breathe the strain,
   John made for his tea-party.
"Yankee doodle—ho! ha! he!
   Yankee doodle dandy,
We kept the tune but not the tea,
   Yankee doodle dandy!"

7. No matter how we rhyme the words,
   The music speaks them handy,
And where's the fair can't sing the air
   Of "Yankee doodle dandy!"
"Yankee doodle, firm and true,
   Yankee doodle dandy,
Yankee doodle, doodle doo!
   Yankee doodle dandy.

AN AMERICAN'S SONG OF HOME

HOME, SWEET HOME

JOHN HOWARD PAYNE

A SONG OF HOME MEMORIES BY AMERICA'S BEST-KNOWN "OLD SONG" WRITER

MY OLD KENTUCKY HOME

STEPHEN C. FOSTER

ANOTHER AMERICAN'S SONG OF MEMORY

THE OLD OAKEN BUCKET

SAMUEL WOODWORTH

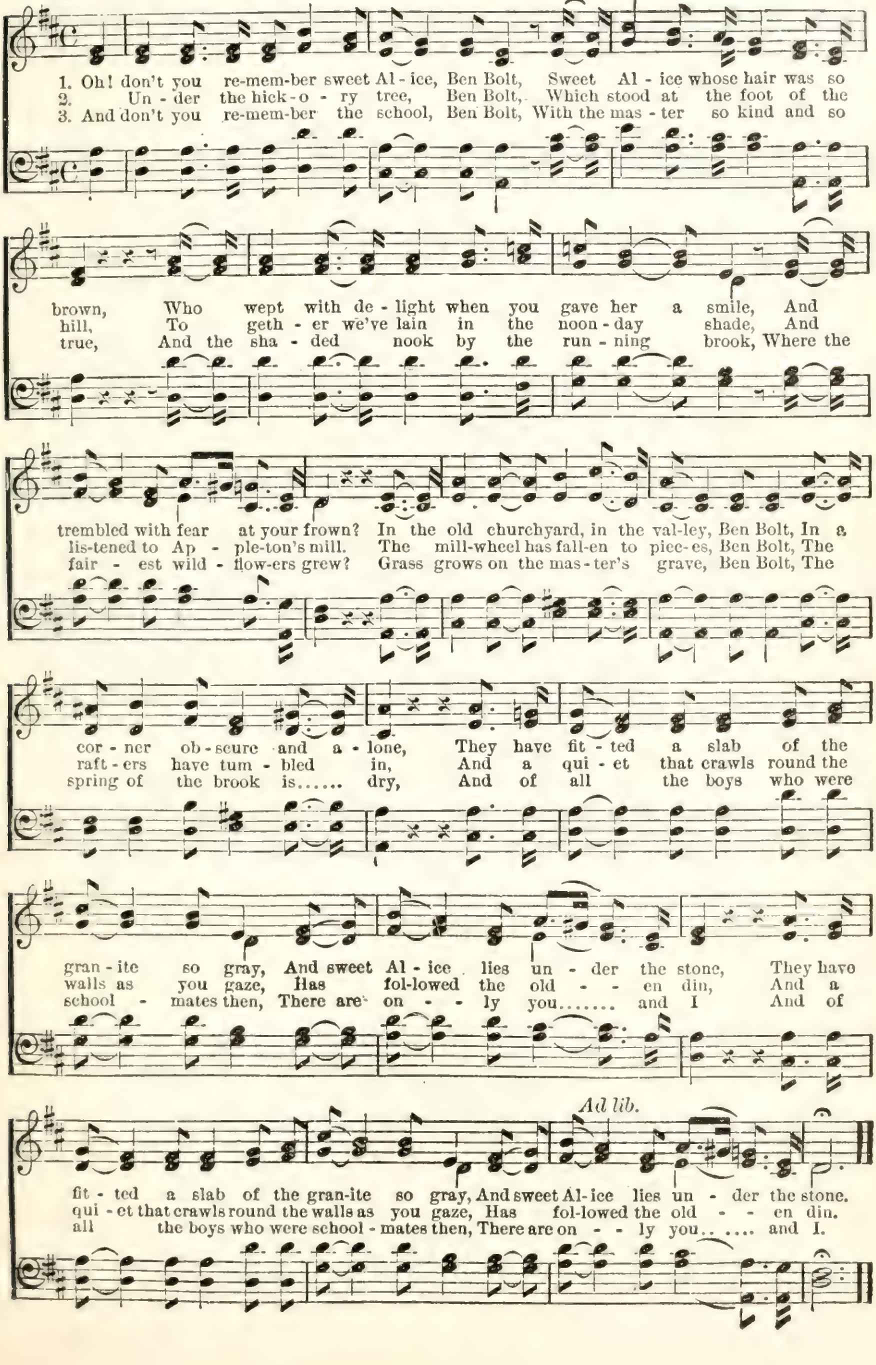
2 That moss-covered bucket I hailed as a treasure,
For often at noon, when returned from the field,
I found it the source of an exquisite pleasure,
The purest and sweetest that nature can yield
How ardent I seized it, with hands that were glowing,
And quick to the white-pebbled bottom it fell,
Then soon, with the emblem of truth overflowing,
And dripping with coolness, it rose from the well,
The old oaken bucket, the iron-bound bucket,
The moss-covered bucket arose from the well.

3 How sweet from the green, mossy brim to receive it,
As, poised on the curb, it inclined to my lips!
Not a full-flushing goblet could tempt me to leave it,
Tho' filled with the nectar that Jupiter sips.
And now, far removed from the loved habitation,
The tear of regret will intrusively swell,
As fancy reverts to my father's plantation,
And sighs for the bucket that hung in the well.
The old oaken bucket, the iron-bound bucket,
The moss-covered bucket which hangs in the well.

THE SONG OF AN AMERICAN BOY GROWN OLD

BEN BOLT

THOMAS DUNN ENGLISH



AN OLD SLAVE HYMN

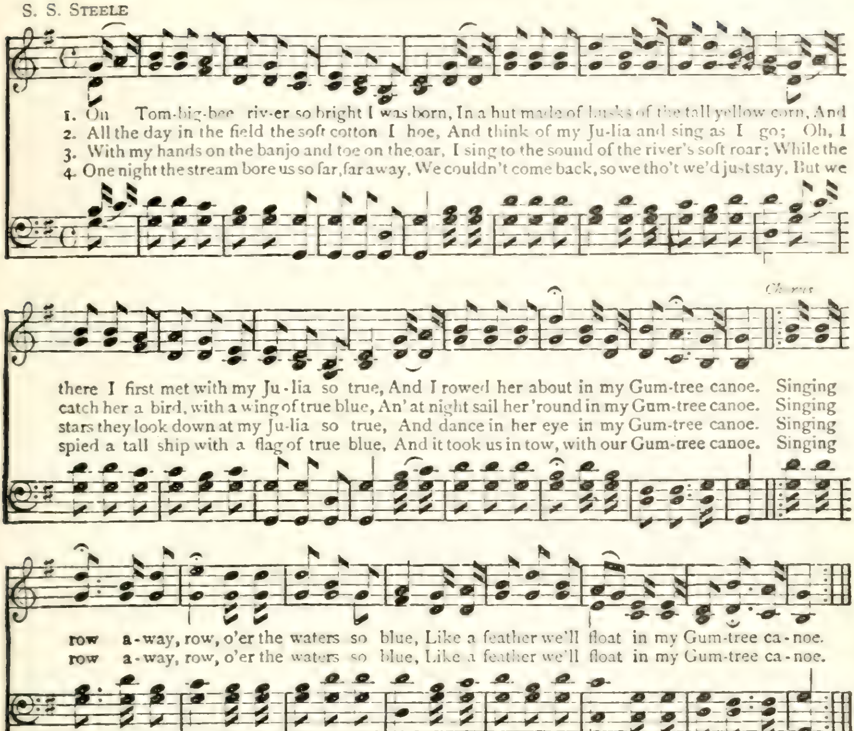
SWING LOW, SWEET CHARIOT

FOLK SONG

A NEGRO LOVE BALLAD

TOMBIGBEE RIVER

S. S. STEELE



A BALLAD OF THE SOUTH

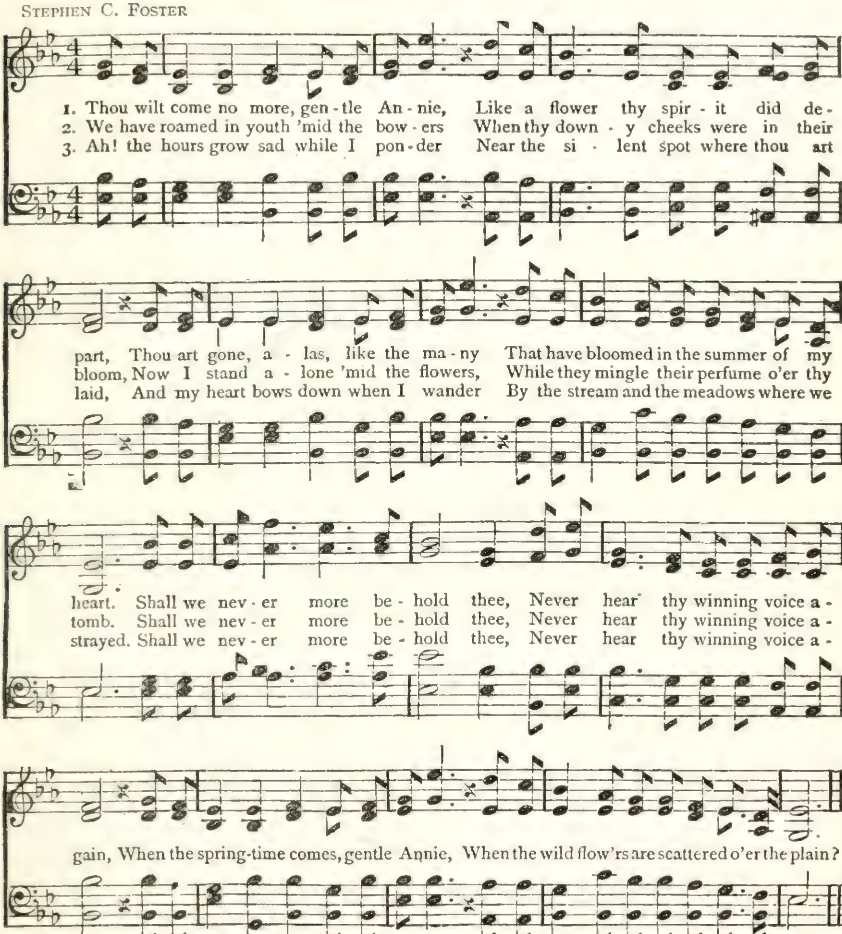
LISTEN TO THE MOCKING BIRD

ALICE HAWTHORNE

A POPULAR BALLAD OF '61

GENTLE ANNIE

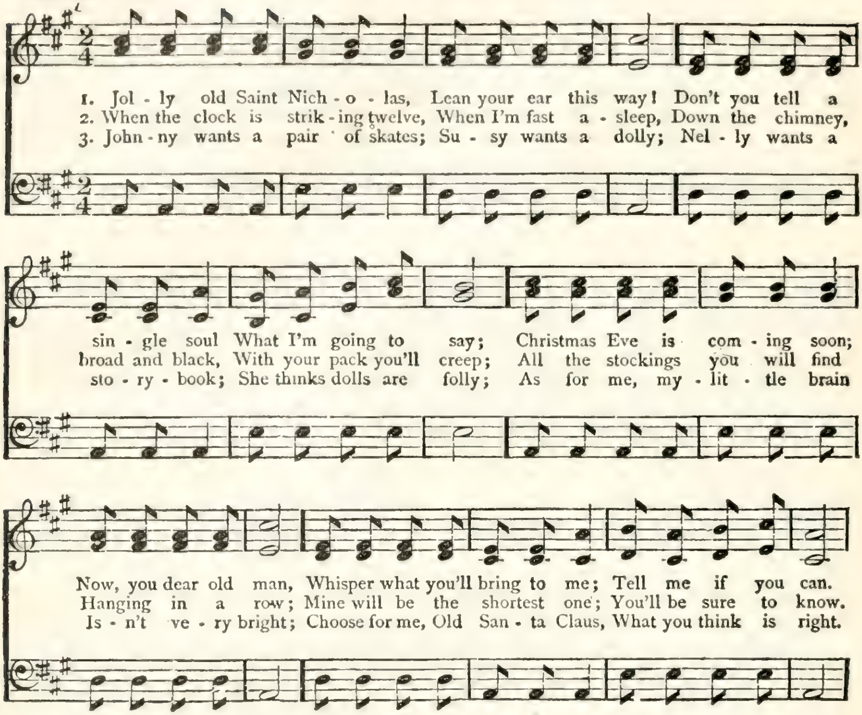
STEPHEN C. FOSTER



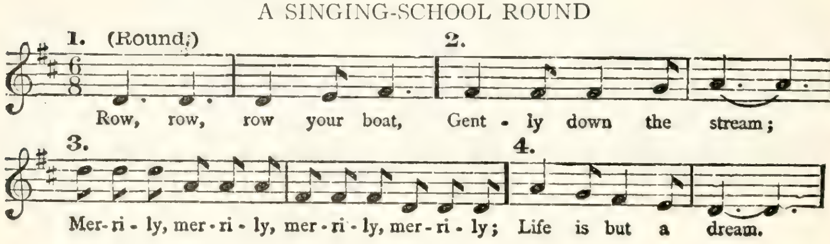
AN OLD SCHOOL SONG

JOLLY OLD SAINT NICHOLAS

ANONYMOUS



A SINGING-SCHOOL ROUND



AN AMERICAN CHRISTMAS CAROL

O LITTLE TOWN OF BETHLEHEM *

PHILLIPS BROOKS

2 For Christ is born of Mary;
  And gathered all above,
While mortals sleep, the angels keep
  Their watch of wondering love.
O morning stars, together
  Proclaim the holy birth;
And praises sing to God the King,
  And peace to men on earth.

3 How silently, how silently,
  The wondrous gift is given!
So God imparts to human hearts
  The blessings of His heaven.
No ear may hear His coming,
  But in this world of sin,
Where meek souls will receive Him still,
  The dear Christ enters in.

4 O holy Child of Bethlehem,
  Descend to us, we pray;
Cast out our sin, and enter in,
  Be born in us to-day.
We hear the Christmas angels
  The great glad tidings tell;
O come to us, abide with us,
  Our Lord Emmanuel.

* Taken by permission from *Christmas Songs and Easter Carols*, published by E. P. Dutton and Company, New York City.

ANOTHER AMERICAN CHRISTMAS CAROL

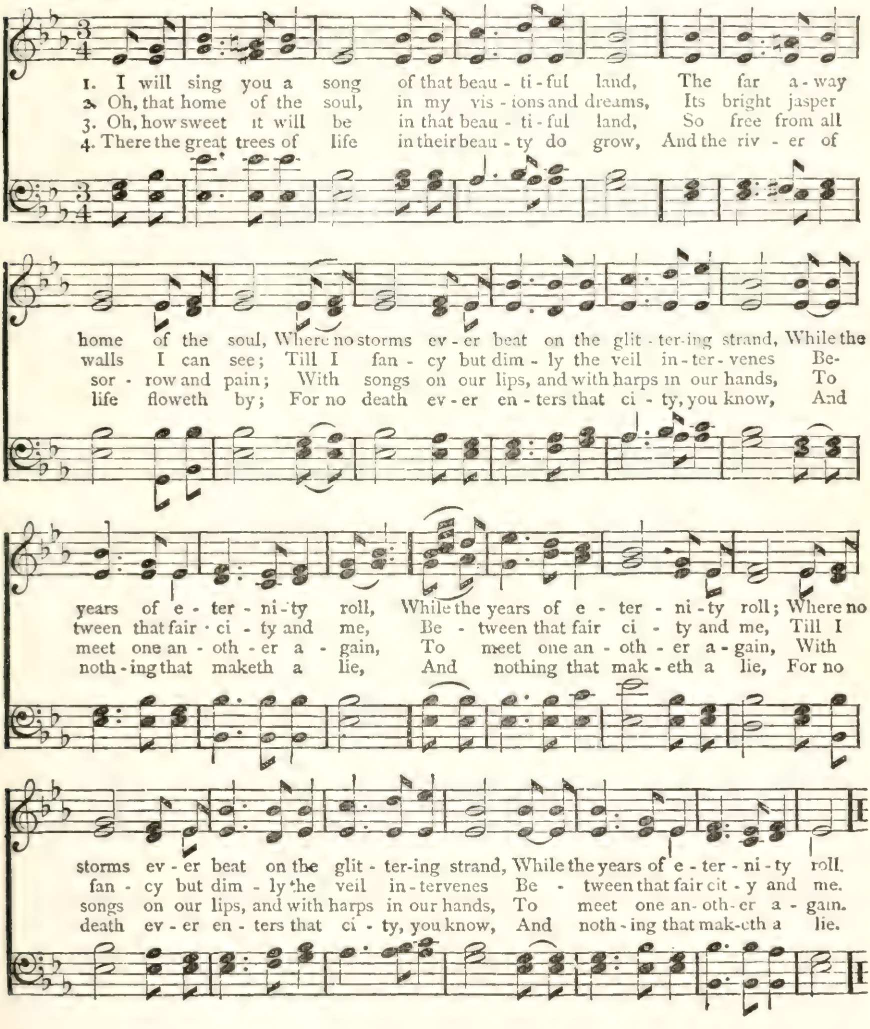
IT CAME UPON THE MIDNIGHT CLEAR

E. H. SEARS

AN AMERICAN MOTHER'S SONG OF THE HOMELAND

HOME OF THE SOUL

Mrs. Ellen Gates



The Cornell Reading-Courses

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VOL. IV. No. 79 JANUARY 1, 1915 FOOD SERIES No. 14

PROGRAMS FOR USE IN STUDY CLUBS

MIRIAM BIRDSEYE

The programs given in this lesson are based on *A Syllabus of Lessons for Extension Schools in Home Economics*,[1] which was published last year as the February issue of the Cornell Reading-Course for the Farm Home. Members of extension schools often wish to continue their study of home economics in study clubs, and these programs have been planned with this end in view. They may be used in the order in which they are given, or any one or ones may be omitted, according to the preference of each club.

In preparing the papers outlined in the programs the syllabus will be found indispensable, but more complete books are needed for constant reference. For this purpose *Foods and Household Management*, by Helen Kinne and Anna M. Cooley, and *Food Values*, are recommended, and each club is advised to get two copies of each. The former, although written as a textbook for high school students, is a practical, up-to-date, and readable guide for the home maker as well. The latter is a bulletin published by the American School of Home Economics, and gives practical methods in diet calculations. The farmers' bulletins, published by the United States Department of Agriculture, and the Cornell reading-course lessons that are cited as references for some of the papers, may be obtained in the manner described on page 110 of the syllabus. For persons who wish to go deeper into the study of foods, *A Laboratory Hand-book for Dietetics*, by Mary Swartz Rose, and *Food Products*, by Henry C. Sherman, are recommended.

In addition to the reference books, each club should own or have the use of a tested scale that will register half ounces. A reliable letter scale will be satisfactory; such a scale may be bought at a hardware store for about a dollar and a half. A blackboard may be used to good advantage. A set of large food charts in color, which make excellent illustrations for

[1] The following corrections should be made: Page 138, first line, the words "legumes, and nuts" should be omitted; page 143, under *Boiled dressing in quantity*, "4 teaspoonfuls salt" should be changed to "2 teaspoonfuls."

the study of foods and which later might be presented to the local school, may be bought from the Superintendent of Documents, Government Printing Office, Washington, D. C., for one dollar.

The secretary of the club should make a list of the reference books and all material needed, and should see that everything is at hand before an attempt is made to carry out any of the programs.

THE DAILY EXPENDITURE OF ENERGY

Roll call.— Each member should respond with some quotation relating to food.

Paper.— The body's need for energy-giving material

Suggestive outline

1. The three needs that the body must satisfy from its food
   a. Energy requirement
   b. Body building substances
   c. Body regulating substances
2. The purpose for which the body spends energy each day
   a. Internal work
   b. External work
   c. Maintaining the warmth of the body
3. Foodstuffs from which the body obtains energy
4. Foods that are recognized as valuable sources of energy
5. The factors that govern the amount of energy expended daily
6. The Calorie, or measure of energy, and its equivalent in work and in heat
7. The housekeeper's dietary short cut, the 100-Calorie portion
8. Method of determining the daily energy requirement, sometimes called the fuel need, of the body on the basis of body weight and of work done
9. A specimen energy requirement for one day, worked out by the writer of the paper

References

Cost of food. Cornell reading-course for the farm home, Vol. II, No. 29

Principles of nutrition and nutritive value of food. U. S. Dept. Agr. Farmers' bulletin 142

Foods and household management, p. 7–12, 295–303. Kinne and Cooley

Paper.— Sugar as a food

Suggestive outline

1. The way in which plants manufacture sugars and starches
2. Representative foods rich in sugar

3. Digestion of sugar; storage of unused sugar as fat
4. The use and abuse of sugar in the diet
5. Sugar as an energy-yielding foodstuff

References

Sugar and its value as food. U. S. Dept. Agr. Farmers' bulletin 535

Rules for planning the family dietary, p. 189. Cornell reading-course for the farm home, Vol. II, No. 41

Foods and household management, p. 164–168. Kinne and Cooley

Discussion.— The members of the club should question the writer of the first paper until they understand clearly the methods of calculating the daily requirement for energy, in order that each member may calculate her own requirement on the basis of her weight and the kinds of work done so that she can report it at the roll call of the next meeting.

A simple method of estimating a person's probable daily expenditure of energy is suggested by the following tables.

Energy requirement for each pound of body weight

For a person at complete rest	14 to 16 Calories
For a person doing light work	16 to 18 Calories
For a person doing moderate work	18 to 20 Calories
For a person doing hard work	20 to 23 Calories

Complete rest includes reading, resting, and sitting at meals.

Light work includes walking; standing at one's work, as in cooking, dish washing, or bed making; hand and machine sewing; typewriting; and the like.

Moderate work includes washing, sweeping, and other equally vigorous forms of housework; bicycling; carpentering; and the like.

Hard work not only involves a good many muscles, but also causes enough strain to harden and enlarge them. House cleaning and heavy sweeping are included under this heading. Lumbermen, excavators, and a few others do even heavier work than this.

Energy requirement during growth[2]

Age in years	Calories per pound per day
Under 1	45
1–2	45–40
2–5	40–36
6–9	36–30
10–13	30–27
14–17	27–20
17–25	Not less than 18

[2] This table is taken from *Foods and Household Management*, by Kinne and Cooley.

The data given in the tables may be worked out in the following way: Mrs. B weighs one hundred and thirty pounds. If she sleeps eight hours, spends two hours a day dressing, two hours sitting at meals, two hours in reading and recreation, four hours in preparing and clearing away meals, four hours in house cleaning, and two hours doing hand sewing, she does a day's moderate work and expends eighteen to twenty Calories for each pound of her weight. Therefore her daily expenditure of energy is 2340 to 2600 Calories.

Exhibit.— During the discussion, two members should be appointed to weigh, measure, and label 100-Calorie, or "standard," portions of granulated, lump, and brown sugar, maple sirup, molasses, dried and fresh fruits.[3] A tested scale that will register half ounces should be used. Members should fix the measures carefully in their minds, as well as make a list of 100-Calorie portions to be inserted on an extra page in the syllabus. The 100-Calorie portions of nonperishable foods may be put in small paper bags and saved for more complete exhibits in the future. These portions should be carefully labeled, and a suggestive form for a label is given here.

100-Calorie Portion

Granulated Sugar

.9 Ounce — 2 Level Tablespoonfuls

Refreshments.— If refreshments are to be served, they should include nut caramel pudding, made according to the recipe given on page 118 of the syllabus. The hostess should write on the board the quantity of materials used in terms of weight and measure and the number of individual portions of the pudding made from the given materials. She should calculate the energy, or fuel, value and the cost both of the whole quantity of pudding and of an individual portion. The whipped cream should be omitted in making this calculation.

One-hundred-Calorie portions of the foods used in making this pudding are: 0.9 ounce light brown sugar; 0.5 ounce English walnut meats; 1.0 ounce cornstarch.

[3] Illustrations of exhibits of 100-Calorie portions of different foods are given in *Foods and Household Management*, by Kinne and Cooley; a table of 100-Calorie portions of some commonly used foods is given on page 301 of the same volume; and in Food Values, pages 14 to 20, will be found a table of 100-Calorie portions of a large number of foods. This last table gives not only the weight of the 100-Calorie portions, both in ounces and in grams, but the approximate measures as well.

CEREALS AND OTHER STARCHY FOODS

Roll call.— Each member should respond by giving her own energy requirement for one day, based on her weight and the kind of work she does, as outlined in the preceding program. These figures should be tabulated on the blackboard.

Paper.— Starchy foods

Suggestive outline

1. The way in which starch is manufactured and stored as a source of potential energy by the plant
2. Representative foods rich in starch
3. The starch grain
4. The parts played by the starch grains, the plant fiber, or the cellulose, and the water in the cooking of starchy foods
5. Reasons for the difference in the time necessary for the proper cooking of potatoes and of cracked wheat; of rice and of oatmeal
6. The digestion of starch and the necessity for the thorough chewing of starchy foods
7. The use made of starch by the body and the way in which the potential energy stored up by the plant is liberated for the use of the animal
8. Starch versus sugar as an energy-yielding food
9. Storage of surplus energy-yielding digestive products in the form of fat
10. The place of starchy foods in the diet

References

Foods and household management, p. 134–137. Kinne and Cooley

Rules for planning the family dietary, p. 187–190. Cornell reading-course for the farm home, Vol. II, No. 41

Potatoes and other root crops as food. U. S. Dept. Agr. Farmers' bulletin 295

Course in cereal foods and their preparation for movable schools of agriculture, p. 24–26, 34–36. U. S. Office of Experiment Stations. Bulletin 200

Paper.— Breakfast cereals

Suggestive outline

1. Place of the breakfast cereal in the diet for young and old
2. Kinds of breakfast cereals
3. Comparison of the amount of energy contained in ten cents' worth of the most-used breakfast cereals and of other starchy foods

4. Breakfast cereals as sources of protein; a comparison with other foods rich in starch in this regard
5. Breakfast cereals as sources of mineral matter; a comparison with other foods rich in starch in this regard
6. The cooking of breakfast cereals
7. Cereals and the fireless cooker
8. Various methods of serving cereals
9. Cereals preferable for young children

References

Cereal breakfast foods. U. S. Dept. Agr. Farmers' bulletin 249

Rules for planning the family dietary. Cornell reading-course for the farm home, Vol. II, No. 41

Cost of food. Cornell reading-course for the farm home, Vol. II, No. 29

Foods and household management, p. 126–137. Kinne and Cooley

Discussion.— The following is a list of questions that may be used in leading the discussion: Why is it poor economy to serve potatoes and rice or potatoes and macaroni at the same meal? What are the qualities of a well-boiled potato? a well-baked potato? How may baked potatoes be kept from becoming soggy if they are not used immediately? Should the skin of a baked potato be eaten? Has a potato boiled in its skin a higher nutritive value than one which is pared or scraped before it is boiled?

Exhibit.— One-hundred-Calorie portions of common starchy foods, such as bread, uncooked macaroni, potatoes, rice, flour, and cereals should be prepared by the method given on page 1520.

Refreshments.— Chocolate cornstarch pudding served in individual cups is a suitable refreshment to serve at this meeting. The cost and the energy value of the whole amount and of each portion should be calculated. Six-tenths of an ounce of chocolate is a 100-Calorie portion.

Suggestions for next meeting.— If a bread contest is to be held at the next meeting, all necessary preliminary arrangements should be made at this time.

For the next meeting each member should prepare a written statement of the following facts to be read at roll call:

1. Name and price per package and per pound of the cereal best liked by each member. Cereals that are sold in packages have the net weight printed on the package.

2. Number of half-pint cupfuls in a package and in a pound of the cereal selected.
3. Energy value of a half pint of the uncooked cereal. All uncooked cereal products, except oatmeal, have an energy value of about one hundred Calories an ounce; oatmeal has an energy value of about one hundred and ten Calories an ounce.
4. Amount of cooked cereal made from a half pint of the uncooked cereal.
5. Energy value of the portion of cereal usually served.
6. Cost of a 100-Calorie portion of the cereal.

BREAD-MAKING CONTEST

Roll call. — Members should respond with facts concerning cereals (page 1521), which the secretary should tabulate on the board as they are read.

Paper.— Flour

Suggestive outline

1. Cereals used in making flour
2. The structure and composition of wheat: parts of the grain valuable in making flour for bread
3. Milling of wheat
   a. Methods of making flour used by primitive women
   b. Later methods of milling
   c. The modern roller process
   d. Grades of flour
4. Characteristics of good flour
5. Comparisons between bread flour and pastry flour, white flour and whole wheat flour

References

Foods and household management, p. 191–197. Kinne and Cooley

Bread and break making. U. S. Dept. Agr. Farmers' bulletin 389

Paper.— Scoring bread: brief explanation of the score card to be used by the committee in scoring and judging the bread

Reference

Some points in the making and judging of bread. University of Illinois. Bulletin 25

Rules for the contest.—

1. All contestants must use standard half-pint measuring cups, bread tins of uniform size, and the same recipe. This recipe may be chosen from the syllabus, from a reference book, or from some standard cookbook.
2. The secretary should assign to each member a number to be used in labeling her entry, and should record these names and numbers in a book. Thus the committee that judges the bread will not be influenced by knowing who baked the loaves entered in the contest.
3. Each contestant must submit one sample loaf of standard size. This loaf must have been baked the previous day, and must be labeled, not with the contestant's name, but with the number assigned to her by the secretary.
4. A committee of three persons must be appointed to judge the bread. The following score card may be used:

Flavor	odor	20
	taste	20
Crumb	moisture	10
	lightness	5
	texture	10
	color	5
Crust	color	5
	depth	5
	crispness	5
	texture	5
General appearance	size	5
	shape	5
Perfect score		100

5. A score card must be filled out for each loaf of bread judged by the committee. These cards will serve as the basis for the discussion, which is the most important part of this program.
6. A prize may be awarded to the maker of the loaf receiving the highest score.

Discussion.— The committee should comment on the different loaves of bread and give reasons for scoring them as it did. Members should ask questions and discuss these points, for this is the most helpful part of the lesson, and should not be passed over hastily or carelessly.

Refreshments.— Sandwiches made of graham nut bread with dates (page 114 of the syllabus) should be included in the refreshments.

FATS

Roll call.— Each member should respond by giving the name of some home-rendered fat, other than lard, which she has used in flour mixtures or in deep frying.

Paper.— Fats and fried foods in the diet of young and old

Suggestive outline

1. Energy value of fat as compared with that of carbohydrates and of protein
2. Balance to be maintained between fats and carbohydrates in the diet
3. Growth-stimulating fats: simple dishes suitable for children in which foods containing such fats play a prominent part
4. The effect on a school child or an office worker of a breakfast or a noon meal overrich in fat
5. Kinds of fat and types of cooked food that are difficult of digestion, and therefore should not be given to young children or to persons of delicate digestion
6. The place of fat in the diet of the active out-of-door worker
7. The place of fruit in the meal rich in fat
8. Three menus for a farm breakfast that shall provide simple food for the growing children and at the same time satisfy the needs of the hearty man of the family

References

Foods and household management, p. 158–162, 309. Kinne and Cooley

Food for school boys and girls. Teachers College, Columbia University. Technical education bulletin 23

The feeding of young children. Teachers College, Columbia University. Technical education bulletin 3

Rules for planning the family dietary. Cornell reading-course for the farm home, Vol. II, No. 41

Paper.— Fat as used in cooking

Suggestive outline

1. The effect of fats in making a flour mixture tender
2. Forms of fat suitable for use as shortening
3. Methods of trying out, or rendering, fat that insure the least waste and the best flavor

4. The use of fats in making sauces and gravies that are smooth and free from floating grease
5. Cooking in deep and in shallow fat
   a. Comparative wholesomeness of food cooked by these two methods: reasons
   b. Reliable tests for proper temperatures of fats for frying cooked and uncooked mixtures
   c. Draining of food cooked in deep fat
   d. Clarifying fat after use in frying
   e. Forms of fat suitable for use in deep frying

References

Foods and household management, p. 163. Kinne and Cooley

Making cake.— Part I. Cornell reading-course for the farm home, Vol. IV, No. 73

Any standard cookbook

Discussion.— The following points should be brought out in the discussion: the uses and the limitations of various butter or lard substitutes; reasons why it is dangerous to pour water on burning fat; materials that should be used to put out such a fire.

Exhibit.— One-hundred-Calorie portions of foods rich in fat, including 1.8 ounces of ordinary cream testing 20 per cent fat, .9 ounce of thick cream testing 40 per cent fat, and .6 ounce of chocolate, should be prepared.

Refreshments.— Fried cakes should be included in the refreshments. Try dipping the fried cakes for an instant into a kettle of boiling water immediately after they are taken from the hot fat. In order to show how much grease is removed from the fried cakes by this process, chill the water, and remove and measure the grease.

MILK

Roll call.— Each member should name some simple dish of which milk is the chief constituent, and which is suitable for a young child or an invalid.

Paper.— Milk as a growth-promoting food: its place in the diet of the young child and of the adolescent boy and girl

References

Rules for planning the family dietary. Cornell reading-course for the farm home, Vol. II, No. 41

The feeding of young children. Teachers College, Columbia University. Technical education bulletin 3

Food for school boys and girls. Teachers College, Columbia University. Technical education bulletin 23

The use of milk as food. U. S. Dept. Agr. Farmers' bulletin 363

Foods and household management, p. 146–152. Kinne and Cooley

Suggestive topics for town and city clubs.—

1. Local standards for the cleanliness of market milk and ways in which these standards compare with those enforced in other communities of the same size
2. The attitude of members of the club, as consumers, as mothers of children, and as club women, toward the local milk question

References

The milk question. M. J. Rosenau

The control of bulk milk in stores. U. S. Bureau of Animal Industry. Circular 217

Publications of the Rochester Board of Health relating to clean milk. Obtainable from the secretary of the board

Discussion.— The discussion should be based on the following questions: What improvements in the milk supply of this town or in methods of distribution are still to be desired? How may such improvements be brought about?

Suggestive topic for country clubs.— Sources of contamination of milk on the farm; effect of dirt on milk; equipment and methods that may be used on the small farm in order to insure cleanliness of milk for home use or for the local market

References

Clean milk. S. D. Belcher

The milk question, Chapter IV. M. J. Rosenau

Discussion.— The following question may be used in starting the discussion: What share of moral responsibility has the woman of the small dairy farm in regard to the selling of clean milk?

Exhibit.— The exhibit should consist of 100-Calorie portions of whole milk, skimmed milk, buttermilk, thick cream (40 per cent fat), and thin cream (18–20 per cent fat).

Refreshments.— A caramel or vanilla junket, served with chopped nuts and whipped cream, or a junket ice cream are suitable refreshments to serve at this meeting. The energy value and the cost of the whole amount and of an individual portion should be calculated.

CHEESE

Roll call.— Each member should respond by naming, without describing, a well-liked dish that contains cheese.

Paper.— Feeding and serving the invalid

References

Foods and household management, p. 273, 275, 318-320. Kinne and Cooley

Paper.— Cheese as a food: some attractive and novel ways of serving it

References

Foods and household management, p. 154-156. Kinne and Cooley

Cheese and its economical uses in the diet. U. S. Dept. Agr. Farmers' bulletin 487

Discussion.— The making and serving of cottage cheese should be discussed in this connection, and the following questions may be used in directing the discussion: In making cottage cheese how may even texture and tenderness be secured? How may cottage cheese be used in salads? in sandwiches? How does cheese made from buttermilk compare with that made from sour milk?

Exhibit.— The exhibit should consist of 100-Calorie portions of bread, butter, lean meat, eggs (in shell), dried beans, shelled nuts, and any kinds of cheese that can be obtained in the local markets, also a 100-Calorie cheese sandwich.

Refreshments.— For refreshments serve, with coffee, any one of the delicious cheese dishes made by the recipes given in Farmers' Bulletin 487.

MEAT SUBSTITUTES

Roll call.— Each member should respond with the name of a dish that contains sufficient protein to be substituted for the meat dish of a meal.

Paper.— Protein in the diet

Suggestive outline

1. The unique service that protein renders in supplying nitrogen for building tissue
2. Value of protein as a source of energy
3. Common foods rich in protein
4. Foods containing protein especially valuable for growth
5. The place of meat in the diet
6. The main factor in determining the daily protein requirement of the healthy adult
7. The daily protein requirement measured in ounces, and measured in ratio of protein calories to total calories
8. The amount of protein needed by growing children compared with that needed by persons fully grown

References

Rules for planning the family dietary. Cornell reading-course for the farm home, Vol. II, No. 41

Cost of food. Cornell reading-course for the farm home, Vol. II, No. 29

Foods and household management, p. 11, 301–305. Kinne and Cooley

Economical use of meat in the home. U. S. Dept. Agr. Farmers' bulletin 391

Paper.— Meat substitutes and ways of extending the flavor of meat

References

Beans, peas, and other legumes as food. U. S. Dept. Agr. Farmers' bulletin 121

Foods and household management, p. 243–245. Kinne and Cooley

Economical use of meat in the home. U. S. Dept. Agr. Farmers' bulletin 391

Discussion.— The members should give their experiences in using fireless cookers. The following questions may be asked: Can a workable fireless cooker be made at home? What materials would be needed for making such a cooker? What would be the cost of these materials? What are satisfactory commercial makes of fireless cookers? insulated ovens?

Exhibit.— The exhibit should consist of portions of food containing approximately a quarter ounce of protein, or from one-eighth to one-thirteenth the total daily protein requirement. The following list of such portions has been calculated from *A Laboratory Hand-book for Dietetics*, by Mary Swartz Rose:

Food	Approximate weight in ounces of portion containing one-fourth ounce protein
Beef, salted, smoked, edible portion	.9
Eggs, in shell	2.1
Codfish, salt, boneless, as purchased	.9
Cheese, American pale	.9
Cheese, cottage	1.2
Milk, whole	7.5
Milk, skimmed	7.4
Lentils, dried	1.0
Beans, dried	1.0
Beans, baked, canned	3.7
Rolled oats, dry	1.5
Bread, white (average)	2.7
Macaroni	1.9
Wheat flour, patent	2.2
Walnuts, California, shelled	1.3
Peanuts, shelled	1.0
Peanut butter	.8
Lean meat, (beef, veal, lamb, mutton, chicken), edible portion, raw[4]	1.2

[4] The same meat cooked would probably furnish about one-fourth ounce protein for each ounce of meat.

Refreshments.— Appropriate refreshments for this meeting are thin slices of cold veal loaf, pork loaf, or salmon loaf, served with bread and butter; a tart jelly or pickle; coffee; and dates stuffed with peanuts or with dairy cheese.

MEAT

Roll call.— Each member should respond with the name of the cut of meat from which she obtains the most satisfactory return for the money expended, and the present price of it per pound.

Paper.— The selection, the care, and the cooking of meat, with especial emphasis on the treatment of the tougher cuts, particularly tough steak

References

Foods and household management, p. 209–221. Kinne and Cooley

Any good cookbook

Economical use of meat in the home. U. S. Dept. Agr. Farmers' bulletin 391

Market classes and grades of meat. University of Illinois. Bulletin 147

Relative economy, composition and nutritive value of the various cuts of beef. University of Illinois. Bulletin 158

Paper.— The sanitary market

Suggestive outline

1. Conditions under which a careful housekeeper would like to have meats marketed
2. Market conditions that could be insisted on by the housekeeper
3. The accepted requirements of a sanitary market as shown by a study of sanitary score cards
4. Local sanitary standards of food distribution that have been established by groups of women
5. Outline of a practicable plan by which women and local dealers could cooperate in establishing sanitary market conditions

Reference

The pure food victory won by the women of Grand Forks. Katherine G. Leonard. The American city, June, 1913

Score cards for use in judging provision stores may be obtained from the boards of health of most large cities and from the Housewives' League, New York City. Several popular magazines publish articles regularly concerning the work of club women for town betterment. The Women's Municipal League of Boston publishes reports on its successful methods of market inspection. The following is a specimen sanitary score card:

SANITARY SCORE CARD

Issued by Food Committee of the National Consumers' League

	Perfect
General surroundings	
Clean 5. Fairly clean 3. Dirty 0	5
Ventilation	
Good 3. Fair 1. Bad 0	3
Lighting	
Good 3. Fair 1. Bad 0	3
Walls, windows, and ceiling	
Clean 3. Fairly clean 1. Dirty 0	3
Floor and fixtures	
Clean 3. Fairly clean 1. Dirty 0	3
Blocks, counters, and the like	
Clean 5. Fairly clean 3. Dirty 0	5
Utensils, instruments, and tools	
Clean 5. Fairly clean 3. Dirty 0	5
Refrigeration	
Adequate 5. Inadequate 2. No refrigeration 0	5
Refrigerators	
Clean 5. Fair 3. Dirty 0	5
Sewage arrangement *	
Sanitary 3. Unsanitary 0	3
Plumbing	
Open 3. Closed 0	3
Cellar floors, walls, windows, ceiling	
Clean 4. Fairly clean 2. Dirty 0	4
Cellar ventilation	
Good 1. Bad 0	1
Employees	
Healthy and apparently free from contagious disease	5
Cleanly in habits	5
Wear clean clothing	5
Store unconnected by door with living room	10
Store above street level	5
Store in basement	0
Food, meat, etc., kept in cleanly manner after receipt	5
Food, meat, etc., not exposed to air	7
Door and window screens in summer	3
Delivery of goods (whether by individual or wagon) conducted in a cleanly manner	7
Grand total	100

* Sanitary sewage arrangement means a condition that conforms to local health regulations. This term will have to be defined separately in each community.

Discussion.— The following question should be used in starting the discussion: What specific improvements should the members of a study club, as consumers and as club women, seek to bring about in the handling of the food supplies of a town?

Exhibit.— Score cards for stores that handle foods should be collected for the exhibit.

VEGETABLES

Roll call.— Each member should name the vegetable, except the potato, that she has served most frequently during the past twelve months. The secretary should tabulate the answers given.

Paper.— The part played by mineral matter in building tissues and in regulating the processes of the body; and the place of fruits and vegetables in the diet

References

Rules for planning the family dietary. Cornell reading-course for the farm home, Vol. II, No. 41

Foods and household management, p. 303–305. Kinne and Cooley

Paper.— Selecting and cooking vegetables

Suggestive outline

1. Deterioration of vegetables after picking
2. Methods to be used in selecting vegetables in the market
3. Loss of mineral salts and other nutrients during the cooking of vegetables: ways of preventing or remedying this loss
4. Some practical yet unusual ways of preparing common vegetables

References

Preparation of vegetables for the table. U. S. Dept. Agr. Farmers' bulletin 256

Foods and household management, p. 109–125. Kinne and Cooley

Any standard cookbook

Losses in the cooking of vegetables. Josephine T. Berry. Journal of home economics, December, 1912

Discussion.— The discussion should center around the subject, tested methods of storing vegetables. A list of the vegetables commonly stored should be given by one member. A simple prize — a packet of vegetable or flower seeds, for instance — might be given to the member who succeeded in keeping the greatest number of vegetables until the latest date of the previous spring.

Exhibit.— One-hundred-Calorie portions of common vegetables should be prepared according to the method given on page 1520. Vegetables that are particularly rich in iron should be so labeled.

GARDEN-PLANNING CONTEST

Roll call.— Each member should name some rather uncommon vegetable she has used for a green salad.

References

Home-garden planning. Cornell reading-course for the farm, Vol. II, No. 34

Vegetable-gardening. Cornell reading-course for the farm home, Vol. II, No. 33

Rules for the contest.— Each member should bring a plan of her last season's vegetable garden, drawn on the scale of one-quarter of an inch for each foot, a list of the vegetables raised, and a statement of the size of her family and the quantity of vegetables canned from this garden. After the club has seen all the plans, a vote should be taken to decide which garden most successfully met the needs of its owners.

A comic prize may be given to the member whose family proves to have the best educated taste in vegetables, judged on the following basis: Provide a list of the common fresh and canned vegetables. As the name of each vegetable is read, each member should score one point for each person in her family over four years of age who eats this vegetable. Each member should divide her total number of points by the number of persons in her household over four years of age in order to obtain the final score. The highest score wins the prize.

For another contest a list should be made of the green potherbs and green salad vegetables, cultivated and wild, used by members of the club. A prize should be given to the woman who has used the largest variety.

Exhibit.— Samples of home-grown and home-canned vegetables would make a suitable exhibit.

AGRICULTURAL CLUBS FOR BOYS AND GIRLS

Roll call.— Each member should give the name of some child of her acquaintance who might be interested in agricultural club work.

Paper.— The agricultural club work being done by the United States Government for school children: A description of the garden clubs, canning clubs, poultry clubs, pig clubs, potato clubs, corn clubs, and

other clubs, organized by the Office of Farm Management of the United States Department of Agriculture

References

What the Government is doing for the farmers' boys and girls. The country gentleman, November 15, 1913

The Government's men have to hustle to keep up with this woman. The country gentleman, November 29, 1913

What the farmers' boys and girls are doing for the government. The country gentleman, December 6, 1913

Paper.— The Cornell canning clubs

References

A canning business for the farm home. Cornell reading-course for the farm home, Vol. II, No. 47

Canning clubs in New York State.— Part I. Organization. Cornell reading-course for the farm home, Vol. III, No. 67

Canning clubs in New York State.— Part II. Principles and methods of canning. Cornell reading-course for the farm home, Vol. III, No. 69

Canning clubs in New York State.— Part III. Canning equipment. Cornell reading-course for the farm home, Vol. III, No. 71

Discussion.— The discussion should include the following question: Would it be advisable for the members of a club as such to promote, through the school or otherwise, some form of agricultural club work among the boys and girls?

Exhibit.— Sample instructions, forms, and the like may be obtained from the Department of Home Economics, New York State College of Agriculture, Ithaca, New York. This material should be mounted on large sheets of cardboard or suspended from cord stretched across one side of the room.

CANNING

Roll call.— Each member should give as nearly as she can remember the number of cans of vegetables put up in canneries that she has used in the last twelve months.

Paper.— Standards used by commercial canners in grading their fruits and vegetables for packing

References

Principles of jelly-making. Cornell reading-course for the farm home, Vol. I, No. 15

The preservation of food in the home.— Part I. Cornell reading-course for the farm home, Vol. I, No. 17

The preservation of food in the home.— Part II. Cornell reading-course for the farm home, Vol. I, No. 19

Canned foods: fruits and vegetables. Teachers College, Columbia University. Technical education bulletin 18

Canned fruits, preserves, and jellies: household methods of preparation. U. S. Dept. Agr. Farmers' bulletin 203

Paper.— What shall the consumer demand of the commercial canner, and how may these demands be made effective?

References

Same as those given for first paper

Discussion and exhibit.— Samples of two or more brands of tomatoes and corn bought at the local stores should be examined for truthfulness of labeling and comparative returns on money invested. This is easily done by following the directions in the bulletin on canned foods given for reference.

FRUITS AND SALADS

Roll call.— Each member should name, without describing, some well-liked or unusual salad.

Paper.— Salads

Suggestive outline

1. Salad greens available in the neighborhood in early spring, summer, autumn, and winter
2. Ways of preparing salad greens for the table
3. Vegetables, meats, and fruits, which combine well with salad greens
4. Marinating a salad
5. The dietary mission of green salads in winter and spring
6. Hearty salads for supper during the hot weather

References

Foods and household management, p. 247–253. Kinne and Cooley

Rice and rice cookery. Cornell reading-course for the farm home, Vol. III, No. 55

Any good cookbook or book on salads

Paper.— Dried fruits: their value in the diet; old and new ways of using them

References

Use of fruit as food. U. S. Dept. Agr. Farmers' bulletin 293

Any good cookbook

Foods and household management, p. 95. Kinne and Cooley

Discussion.— Each member should give her most-used recipe for salad dressing. The subject of palatable and inexpensive substitutes for olive oil in salad dressings should be discussed.

Exhibit.— Each member should bring a sample of some home-canned fruit, preserves, marmalade, jelly, or the like, plainly labeled. If possible the recipe should be brought with the sample.

Refreshments.— A rice or a fruit salad, bread and butter sandwiches, and coffee would be suitable for refreshments.

PLANNING A DIETARY FOR ONE PERSON

Roll call.

Paper.— Factors to be considered in planning the dietary of an adult

References

Rules for planning the family dietary. Cornell reading-course for the farm home, Vol. II, No. 41

Foods and household management, p. 308–315. Kinne and Cooley

Paper.— A dietary for one day for a woman 30 years old, weighing 120 pounds, and doing light work. This dietary should supply approximately 2160 Calories and 2 ounces of protein,[5] and should include as well generous amounts of the foods that will supply iron, lime, and phosphorus. There should also be borne in mind the necessity for neutralizing the inorganic acids left behind in the body when certain high-protein foods are used (syllabus, p. 128) by the basic residues, which result from the free use of milk, legumes, fruits, and vegetables.

References

Foods and household management, p. 299–315. Kinne and Cooley

Food values, p. 14–20. American school of home economics.

Suggestions.—The menu should be very simple and 100-Calorie portions, or fractions of them, should be used. The following points should be brought out concerning each food: (1) the number of portions used, (2) the measure, (3) the energy value in Calories, (4) the weight of protein present in the high protein foods calculated from the table given on page 1529. The small quantities of protein present in butter, watery fruits, and vegetables should be disregarded.

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[5] Two ounces of protein consumed in the body yield 226.8 Calories, thus providing in this dietary about 11 Calories derived from protein alone for every 100 Calories derived from the total food. The advocates of a low protein diet suggest a proportion of about 10 so-called protein Calories to every 100 total Calories, while the authorities who favor a larger proportion of protein in the diet suggest a proportion of 15 protein Calories to each 100 total Calories. The advocates of a diet rich in protein would therefore prefer about 2.9 ounces, instead of 2 ounces, of protein for a dietary providing 2160 Calories from the total food.

The opinion seems to be gaining ground to-day, however, that the amount of protein provided is less important than the kind of protein foods selected, and preference is being given to those forms of protein that do not readily putrefy in the large intestine or leave behind them in the body a large amount of inorganic acids.

Before this paper is presented the dietary should be written on the blackboard or on very large sheets of wrapping paper with ink and a camel's-hair brush. The reasons for choosing the foods that constitute the dietary and the methods of calculating the results should be fully and clearly explained. This paper should be assigned to a member who figures accurately and easily, and who is able to lead the discussion.

PLANNING THE FAMILY DIETARY

Roll call.

Paper.— How to plan diets for growth[6]

References

- Foods and household management, p. 300–307, 311. Kinne and Cooley
- Rules for planning the family dietary. Cornell reading-course for the farm home, Vol. II, No. 41
- The feeding of young children. Teachers College, Columbia University. Technical education bulletin 3
- Food for school boys and girls. Teachers College, Columbia University. Technical education bulletin 23
- The box luncheon. Cornell reading-course for the farm home, Vol. II, No. 43

Food Requirements *

Members of family	Age	Weight in pounds	Total Calories	Protein Calories
Man	40	154	2,680	268–402
Woman	38	120	2,160	216–324
Girl	16	110	2,200	220–330
Boy	6	40	1,600	160–240
Total requirements	......	......	8,640	864–1296

*Adapted from *Foods and Household Management.*

[6] In case the majority of the club members have young children, this topic might profitably be expanded to occupy one or more whole programs.

Paper.— A simple dietary for one day for a family of four persons, as indicated in the table given. The protein should furnish from ten to fifteen per cent of the total Calories, and this should be compared with the protein requirements of the dietary outlined in the preceding program

References

Foods and household management, p. 302, 307–314. Kinne and Cooley

Food values. American school of home economics

Discussion.— Members should discuss the dietary to see whether it provides sufficient lime, iron, and easily utilized protein for the growing children and for the adults.

SUGGESTIONS FOR A FINAL MEETING

As a social meeting to conclude the series of programs outlined in this lesson a " Calorie supper " might be planned somewhat as follows:

Small groups of members should be appointed to submit menus and estimates for a supper in which all dishes would be served in individual 100-Calorie portions, or multiples thereof. The total estimated cost of the materials should be divided by the number of 100-Calorie portions they supply, in order to obtain the cost per 100 Calories of food. The menu that provides the most attractive supper at the lowest cost per 100 Calories and the smallest expenditure of human energy for preparation, should be selected. A menu card in the form of a dietary should be placed on each table. The energy value and the cost per 100 Calories of each portion should be shown on each card. The columns should be totaled so that each person can see the total energy value, the total cost, and the average cost per 100 Calories for the meal.

CORNELL STUDY CLUBS IN HOME ECONOMICS

The Cornell Study Clubs in Home Economics are an outgrowth of the reading-course for the farm home. There are now 40,000 members enrolled in the reading-course, and in numerous study clubs the women are using the lessons as a basis of study and of program making. The clubs meet in some cases monthly throughout the year and in others bimonthly at a central place in the community. The program is made in advance. The lessons are studied at home and discussed at the meetings, and the members prepare and present papers on various subjects relating to the reading-course. In many instances other subjects form a part of the program.

The Department of Home Economics of the New York State College of Agriculture, Ithaca, New York, will be glad to correspond with any group of women who desire to form a club. Sometimes a member of the staff may be sent to assist in organizing, and later on assistance may be given in lectures and demonstrations before the clubs. At the present

time the following clubs are organized either as separate clubs or as branches of larger clubs.

Place	Name of club	Date of organization
Adams		December, 1913
Adams Center	University Extension	October, 1909
Albany	Mothers' Club	January, 1914
Auburn	Cornell Study Club	May, 1911
Auburn	Housekeepers' Club	April, 1913
Baldwinsville	Pleasant Hour	August, 1912
Baldwinsville	Beaver Lake	February, 1914
Ballston Lake	Charlton Cornell Study Club	1907
Ballston Springs	Ballston Center Study Club	January, 1913
Batavia	Oakfield Road Ladies' Aid Society	February, 1913
Bay Pond	St. Regis	July, 1914
Bellona	Farmers' Wives' Club	October, 1909
Belmont	Amity	1906
Black Creek		January, 1914
Blodgett Mills	Canning Club (Group I)	June, 1914
Blodgett Mills	Canning Club (Group II)	June, 1914
Breakabeen	Cornell Reading Club	June, 1912
Brewerton	Neighborhood Sunshine	November, 1909
Brookhaven	Fireplace Library Club	October, 1913
Burdett	Wednesday Afternoon Club	January, 1908
Cassville	Bridgewater Valley	1904
Cassville	Pokanoket	July, 1912
Chadwicks	Sagh-da-qui-da	September, 1908
Cincinnatus	Canning Club	June, 1914
Clayville	Valley Club	January, 1913
Clinton	Brimfield Street	1906
Clinton	Chuckery	October, 1906
Clinton	United Progressive	November, 1912
Constableville	Farm and Village Club	1914
Coopers Plains		November, 1912
Cortland	Canning Club	June, 1914
Cortland (R. F. D.)		June, 1914
Cuba	Domestic Science Club	January, 1914
Cuyler	Cuyler Canning Club	1914
Deansboro	Hill-en-dale	January, 1914
Demster	The Kountry Sisters	June, 1914
Dolgeville		August, 1914
Eastchester		January, 1915
East Homer	Canning Club	June, 1914
East Smithfield, Pennsylvania	Cornell Reading Club	July, 1913
East Worcester	Pine Hill Avenue Club	January, 1912
Erieville		May, 1914
Fillmore	Rural Improvement	1909
Fredonia	Cornell Reading Circle	1909
Genoa	Farm Home Reading Circle	October, 1911
Gowanda	Singing Social Society	May, 1912
Groton	East Groton Political Equality	November, 1912
Hall	The Round Table	February, 1910
Hamilton	Hamilton Center Club	March, 1913
Hannibal	Mutual Help Club	January, 1912
Hannibal	Political and Domestic Economy Club	1909
Hannibal	Stone Schoolhouse	March, 1912
Igerna	Cornell Study Club of the Gore	April, 1913
Ilion	Tourists' Club	October, 1912
Ithaca	Ladies' Wednesday Club	February, 1910
Jay		December, 1914
Lawtons	Home Economics Club	March, 1914
Ledyard		September, 1912

Place	Name of club	Date of organization
Leeds	Friday Club	October, 1910
Lewiston		January, 1913
Little Falls	Rural Progress	June, 1914
Little York	Canning Club	June, 1914
Locke	East Genoa Club	February, 1915
Lockport		October, 1911
McGraw	Canning Club	June, 1914
Madison	The Indian Opening Club	February, 1915
Marathon	Canning Club	June, 1914
Merrifield	Bolt's Corners	February, 1915
Messengerville		February, 1915
Milan, Pennsylvania		July, 1913
Moira		March, 1914
Mongaup Valley		1910
Moravia	Four Town Canning Club	October, 1914
Morrisonville		December, 1914
Morrisville	Pleasant Valley	June, 1912
Newfield	Ladies' Monday Club	1893
New York City	College Settlement	December, 1910
North Collins		April, 1914
North Rose	Assodorns Camp Fire Girls	October, 1914
Ossining	Women's Neighborhood	November, 1914
Ovid	Twentieth Century Club	1909
Owasco	Ladies' Aid Society	February, 1913
Oxford	Thursday Afternoon Club	March, 1910
Paris	Hilltop Club	1908
Penn Yan		March, 1915
Portland	Oneida Club	May, 1912
Preble	Canning Club	May, 1914
Richmondville	Marion	1906
Richville	Grange	1907
Roxbury	Morse Settlement	November, 1912
Sangerfield	Sangerfield Center Club	August, 1914
Saranac	Saranac Valley Club	December, 1914
Sauquoit	Meadow Lark	July, 1914
Sauquoit	Hillside Club	November, 1907
Sauquoit	Hill-Dale Cornell Club	August, 1913
Sauquoit	Norwich Corners	July, 1914
Schenectady		December, 1912
Schenectady	Alplaus	January, 1914
Scipioville		June, 1913
Sidney	American University	March, 1915
Sidney Center	Women's Club	1910
Smithville South	The Mothers' Society	November, 1913
Springville	Home Economics Club	November, 1911
Syracuse	National Railway Mail Clerks' Association	October, 1912
Trumansburg	Deh-ge-wa-nas Camp Fire	February, 1914
Truxton	Canning Club	1914
Union Springs	Barber's Corners Reading Club	November, 1908
Waterville	Beaver Creek	January, 1914
Waterville	Sangerfield	July, 1913
Waterville	Sunnyside Club	July, 1912
Wayland		July, 1914
Webster	Discovery Club	November, 1906
Westfield	Round-the-Corner Club	December, 1912
West Winfield	East Winfield	November, 1913
West Winfield	North Winfield	November, 1912
West Winfield	Hackley Street	December, 1908
Williamsville	Auld Lang Syne	1905
Woodhull	Sunnyvale Social Improvement Society	August, 1914
Yorkshire	Farm Home Reading Club	December, 1909
Yorktown Heights		November, 1914

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POTATOES IN THE DIETARY

HELEN CANON

Of the millions of bushels of potatoes produced annually in the United States, by far the greater proportion is used as food. This is due largely (1) to the mild flavor, of which the appetite does not tire; (2) to the established wholesomeness of the vegetable; (3) to the low price, considering the nutriment furnished; (4) to the comparative success of storage. The demand in the American market is for potatoes from two to three inches in length and from five to ten ounces in weight. These cook more uniformly, give a better appearance when served, and insure a more accurate weight when sold by measure than do large potatoes. Moreover, the waste involved in cutting a large potato is eliminated.

GENERAL CONSIDERATIONS

QUALIFICATIONS FOR COOKING PURPOSES

Much attention is now being paid to improving the potato for cooking purposes. In America the market demand is for potatoes having a starchy flavor, a mealy texture when cooked, and a white appearance. Mealiness appears to be due to the presence of a certain amount of starch in the cells. The grains expand with heat, and if sufficiently numerous they will cause the walls of the potato structure to break down, while an inadequate number will result in the potato's retaining its form and becoming soggy. Potatoes with a starch content of from 18 to 20 per cent usually have a mealy quality, although this content may not be the direct cause. Other factors also enter into the question. From Professor Gilmore's[1] investigations it seems that the cooking value of the potato depends on its structure, together with the arrangement and distribution of the starch and water areas. Even experts have difficulty in judging the quality of potatoes by appearance. In general, however, the following characteristics will be of help to the housewife in selecting a potato: (1) a netted skin with a corky appearance; (2) crispness when cut.

[1] J. W. Gilmore. Quality in potatoes. Cornell Univ Agr. Exp. Sta. Bul. 230. 1905.

Although there seems to be a greater demand for varieties with a yellow or a whitish skin, experiments show that the pink-skinned varieties are equally good for table use. Europeans, more discriminating than Americans in their selection, choose with reference to the method of cooking. They prefer a more waxy potato — one low in starch content and high in protein — for frying in deep fat or for salad, in which cases mealiness is not desired, but prefer the mealy potato for baking, mashing, and such purposes. Passing by the several important factors influencing the production of a good quality, the fact remains that handling and storing both play an important part in the condition of the potato at the time of cooking.

PLACE IN THE GENERAL DIET

It has been shown from the data of fifteen American dietary studies representative of ordinary food habits that potatoes represent 3.9 per cent of the total cost of food, and that they furnish 5.3 per cent of the total Calories, 4.2 per cent of the total protein, 8.7 per cent of the total phosphorus, and 13.5 per cent of the total iron. Since phosphorus and iron compounds are as important to include in the dietary as protein and fuel foods, it is seen that for the small percentage of money expended for potatoes a generous supply of nutrients is obtained.

DIGESTIBILITY

There has been some contention over the digestibility of potatoes. While there may be individual peculiarities in this respect, experiments have shown that from 68 to 73 per cent of the protein and from 92 to 99 per cent of the carbohydrate of potatoes is digested by the average person. The occasional statement that its large content of cellulose makes the potato difficult to digest has been answered by the fact that nearly all the cereal and vegetable foods contain as much cellulose as does the potato, or more. The method of cooking probably has a slight effect on digestibility, the well-cooked mealy potato probably being in better condition for the action of the digestive juices than the poorly cooked one in which the starch grains have not broken the cell walls.

FUNCTIONS OF FOOD

The purpose of food is to supply the body and all its parts with material for its growth and repair and with the energy required by its daily activities, and to keep it in good running order. We have long realized our dependence on starches, sugars, and fats for energy with which to do our work and keep warm; on proteins, as furnished by milk, eggs, meat, and legumes, for building material both in the development and in the

repair of the body; on water for its important part in the transportation of the food within the body, for keeping the food in dilute form, and for washing out waste from tissues and intestines. However, the majority of housewives have not realized the importance of another group of foodstuffs, the mineral, or ash, constituents of our food.

Although their percentage in foods is small, the part the ash constituents play in constructing tissue and in keeping the body in good working order is by no means a minor one. Calcium is important in building bones and teeth; phosphorus is essential not only to build tissue but also to stimulate growth; iron is necessary for making red blood cells and other tissues. Vegetables furnish iron in larger proportions than do most animal foods.

All the fluids of the body must be kept slightly alkaline. This is best accomplished by including sufficient base-yielding substances in our foods. Certain of the ash constituents in the food materials are so changed in their course through the body that the final product is an acid; others yield as a final product a base, or alkali. In most of our food materials both these kinds of ash constituents are included. The quantity of the acid-forming elements as compared with the quantity of the base-forming elements therefore determines whether a particular food material is acid-forming or base-forming in the system. The acid-forming foods, which are meats, eggs, and cereals, should be balanced in every meal by those that are base-forming, namely, fruits, vegetables, legumes, and milk, in order that an acid condition in the system may not result. An excess of bases in the daily dietary is probably more favorable to health conditions than an excess of acids. This explains why a meal of meat and cereal, while being fairly well balanced as to starch and protein, needs the addition of a fruit or a vegetable. In vegetables lies our chief dependence for salts of potassium and magnesium, two of the important base-forming elements.

SPECIFIC FUNCTIONS AS SERVED BY THE POTATO

Constituents

Turning now to the potato it is found that a very high proportion, from 75 to 79 per cent, is water; from 18 to 20 per cent is carbohydrate, chiefly starch; from 2 to 2.5 per cent is protein; about 1 per cent, a relatively large amount, is ash; and an inconsiderable proportion is fat.

From this it is seen that the potato is rightly called a starchy food. Its value is not dependent on its high starch content alone, however, for it supplies also bulk,[2] another requirement in the diet. Further, in the mineral content are found moderate amounts of the necessary compounds

[2] By bulk is meant that part of a food which is not digested and absorbed and which therefore is of service in hastening waste products along the intestinal tract.

of calcium and phosphorus, a relatively high percentage of iron, and a very high percentage of the base-yielding potassium.

From the standpoint of acid-forming and base-forming qualities it is fairly exact to say that one medium-sized potato furnishes enough bases to neutralize the acids of two average slices of roast beef. Now if we should substitute rice for potato in such a meal, we should find that, while rice supplied the necessary starch, it did not serve to counteract the acids produced by the meat, but rather increased them. Consequently we should have to restore the balance by adding a vegetable or a fruit or both.

Another property, or constituent, possessed by the potato is of considerable importance although it is not yet fully understood. For want of a better name it is often called *vitamine*, because it is essential to life. Speaking of the property of preventing scurvy, possessed by fruits, vegetables, and milk, Dr. Sherman[3] says: "The evidence has seemed to favor the view that this property is chiefly due to the predominance of base-forming ash constituents, but recent work indicates that vitamines must also be taken into account in this connection." This makes it appear that there is still more to be learned about the constituents of the potato that make it a valuable article in our meals. In this regard it is especially beneficial in a dietary in which white bread is used, because in the refining process the wheat loses this vitamine property, or constituent.

Cost as compared with flour and bread

The low price of the potato has been mentioned as one cause of its extensive use as food. A comparison of the values to be obtained from ten cents' worth of potatoes, of patent flour, and of white bread, respectively, shows the following: When potatoes are selling at 60 cents a bushel, or 1 cent a pound, after removing the inedible portion (in this case the skin) the cost of the edible portion is really 1.2 cents a pound; when they are selling for $1 a bushel the cost of the edible portion is 1.9 cents a pound. Patent flour at $1.10 for 25 pounds costs 4.4 cents a pound. White bread, averaging twelve ounces to a five-cent loaf, costs 6.6 cents a pound. In ten cents' worth of each of these three articles, potatoes give from 62 to 99 grams of protein (depending on the price paid), flour 115 grams, and bread 64 grams. Comparing the energy value, one of the main purposes for which these foods are usually included in our meals, potatoes furnish from 2362 to 3780 Calories,[4] flour 3639 Calories, and bread 1773 Calories; thus, from potatoes at either price we are getting considerably more energy than from bread. Of the minerals, ten cents spent for potatoes may buy from three to four times as much calcium and from three to

[3] H. C. Sherman. Food products, p. 356. 1915.

[4] In measuring the energy value of food a unit is necessary, just as in measuring weight. The Calorie is this energy, or heat, unit.

five times as much phosphorus as in the flour or the bread purchased; from two to four times as much iron as in the flour, and about ten times as much as in the bread. From the standpoint of acid-forming and base-forming materials, the excess of base-forming elements in ten cents' worth of potatoes may be 161 to 258 units; while in flour there may be an excess of 99 units and in bread of 48 units of acid-forming elements. The accompanying table shows these facts clearly and in condensed form:

WHAT TEN CENTS WILL BUY IN GRAMS

Food	Cost a pound	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Calories	Calcium, reckoned as CaO (grams)	Potassium, reckoned as K_2O (grams)	Phosphorus, reckoned as P_2O_5 (grams)	Iron (grams)	Excess	
										Acid	Base
Potatoes	$.012	99.30	4.50	834.60	3780.0	.720	24.0	6.35	.0580	....	258.0
Potatoes	.019	62.06	2.81	521.62	2362.5	.450	15.0	3.96	.0362	....	161.3
Flour (patent)	.044	115.31	10.28	771.23	3638.8	.183	....	1.47	.0145	99.3	.....
Bread (average white)	.066	63.69	8.21	360.96	1772.7	.194	....	1.33	.0052	48.1	.....

METHODS OF COOKING POTATOES

EFFECTS OF COOKING

Cooking a potato increases its palatability and makes it more easily digested. Heat transforms the water into steam, and the resulting expansion breaks down the cell walls and lets out the starch grains; the protein becomes coagulated, just as the white of egg does when cooked; the mineral salts are only slightly affected. However, by the methods of preparation that are perhaps most commonly used, a very large proportion of the nutritious substances may be lost. From all points of view, baking and steaming are apparently the best methods of cooking potatoes, and the latter method has the advantage in economy of fuel used. A potato baked in a slow oven is much inferior to a potato properly boiled, however, because the heat has not been intense enough to cause the cell walls to be broken down and the result is a soggy mass on which the digestive juices cannot act freely. Too rapid boiling is likely to pulverize the outside of the potato before the inside becomes tender, thus causing waste and an unattractive appearance when served. The method by which potatoes are cooked deserves consideration because it affects both the nutrition and the pocketbook.

LOSSES IN COOKING

The chief ways in which losses of nutritive matter occur in cooking potatoes are (1) in paring, both by cutting away valuable material and by exposing the soluble substances to the action of the water, (2) in exposing

a large amount of surface to the water, as when the potato is cut in dice, (3) in soaking before cooking, (4) in the use of cold water at the beginning of the cooking.

It has been estimated that in paring a potato the loss may be 20 per cent. When it is remembered that the larger proportion of the valuable protein and mineral matter is in the outer layers, it is seen how serious this loss is. Must the skin be eaten, then, in order to get all the nutriment? The skin is not palatable to all persons, although some like it. But if it is to be removed, it should be borne in mind that the waste of total substance is about twice as great when the paring is done before the boiling as when it is done afterward. The skin tends to hold back the mineral salts, the protein, and the starch. Since the juice of the potato contains 85 per cent of the protein and 85 per cent of the ash, these substances are easily extracted without this protection. Only the skin comes off after cooking, and it peels off with much greater ease; there is thus a saving of both nutriment and time in removing the skin after cooking.

If the potato is cut into dice before cooking, the increased amount of surface exposed will result in still greater extraction of nutriment, although if prepared just before cooking and plunged immediately into boiling water the loss is minimized.

If potatoes are pared somewhat in advance of the time of cooking, it is noticed that on standing they become dark. In order to overcome this difficulty the potatoes are covered with water and allowed to stand until it is time to cook them. Old potatoes are often soaked in cold water. Experiments have shown that a pared potato soaked for from three to five hours loses about three times as much of its mineral matter and seven times as much of its protein as one that is pared and put on to cook immediately. When potatoes are both pared and soaked, the loss in one bushel is estimated as equivalent to one pound of sirloin steak. This indicates that time should not be taken "by the forelock" when preparing vegetables for a meal, except in case of emergency. If old potatoes must be soaked in order to improve their condition, let it be with the skins on.

Another factor influencing loss of nutriment is the temperature of the water in which the potatoes are put on to cook. Here again experiments prove that there has been waste of the materials for which money has been spent. In this case the use of cold water instead of boiling water at the beginning gives an inconsiderable loss of ash, but over twice as great a loss of protein. If the potatoes are washed thoroughly, and then, without being pared or soaked, are put on to cook in boiling water, there is practically no loss.

In other words, when potatoes are cooked by the most wasteful method (skins removed, potatoes soaked, cooking started in cold water) the loss

of protein is 51 per cent and that of ash is 38 per cent; when cooked by the least wasteful method (skins not removed, potatoes not soaked, cooking started in boiling water) the loss of protein is 1.6 per cent and that of ash is 4.9 per cent.

The following conclusions, then, are inevitable: (1) potatoes should be cooked in such a way as to retain the valuable nutritive matter; or (2) the material extracted from them should be used in soups, sauces gravies, and the like.

RECIPES FOR USING POTATOES

It will be found that practically all potato dishes may be made successfully and at the same time the above principles of economy be observed. In the following recipes, therefore, let it be understood that baking, steaming, or cooking in boiling water with the skins on, is the preparatory step to any of the more complicated processes. If the skins are imperfect and paring is necessary, do not let the potatoes soak, but plunge them immediately into boiling water.

Left-over potatoes may be used successfully in the recipes that are indicated by an asterisk (*).

BAKED POTATOES

Select potatoes of uniform size; wash them with a vegetable brush; place them on the grate in a hot oven; and bake them for forty-five minutes or until soft. Crack the skin in order to let out the steam which otherwise would condense and cause sogginess.

Stuffed potatoes

Cut baked potatoes in half, remove the pulp, mash it, add enough milk for the usual consistency of mashed potatoes, and season with butter, salt, and pepper. Fill the cases with this mixture, dot the tops with butter or brush with milk, and bake for eight or ten minutes in a hot oven. Potatoes may be stuffed in the morning and heated at noon or in the evening for dinner.

Variations.—To the mashed potatoes, before the cases are filled, may be added any one or a combination of the following:

a. Beaten white of egg (1 egg to 3 medium-sized potatoes)
b. Grated cheese ($\frac{1}{2}$ cupful to 3 medium-sized potatoes)
c. Chopped meat ($\frac{1}{2}$ cupful to 3 medium-sized potatoes)
d. Chopped parsley (1 tablespoonful to 3 medium-sized potatoes)

Scalloped potatoes *

Remove the skin from boiled potatoes and cut in slices one-fourth inch thick. Arrange the sliced potatoes in layers in a buttered baking

dish, covering each layer with white sauce (recipe below). Sprinkle the top with buttered crumbs and bake for about twenty minutes.

Raw potatoes may be used, the loss being minimized by careful paring. In this case, sprinkle each layer with flour, butter, pepper, salt, and lastly pour in just enough milk to be seen through the top layer. Bake for about an hour, or until the potatoes are tender.

Variations.—Add in layers:

a. Hard-cooked egg, sliced
b. Grated cheese
c. Minced ham

White sauce

2 tablespoonfuls butter	$\frac{1}{2}$ teaspoonful salt
2 tablespoonfuls flour	Pepper
1 cupful milk	

Melt the butter, remove it from the fire, add the flour, the salt, and the pepper, and stir the mixture until smooth. Replace the mixture on the fire, add the milk, and stir the sauce until it thickens. Cook it for fifteen minutes over boiling water or for five minutes directly over the fire, stirring it constantly.

POTATOES COOKED IN BOILING WATER OR STEAM

Boiled potatoes

Select potatoes of uniform size; wash them with a brush; and plunge them into boiling salted water (1 teaspoonful salt to 1 quart water). Cook them with the cover of kettle ajar, until tender, from twenty to thirty minutes. Drain the potatoes; remove the skins; dress the potatoes with butter if desired; and serve them immediately. If it is necessary for the potatoes to stand a few minutes before being served, cover them with a cloth, not a lid, in order that the steam as it condenses may be absorbed by the cloth and not returned to the potatoes to make them soggy. This is the reason for serving potatoes in an uncovered dish.

Variations.—

a. Add white sauce
b. Sprinkle with chopped parsley

*Potato salad**

6 cold boiled potatoes	$\frac{1}{2}$ tablespoonful salt
4 tablespoonfuls salad oil or melted butter	Cayenne pepper
2 tablespoonfuls vinegar	2 tablespoonfuls chopped parsley
	Few drops onion juice

Cut the potatoes in one-half inch cubes. Make a dressing by mixing thoroughly the other ingredients. Pour this dressing over the potatoes, and allow them to stand for fifteen minutes. Drain off any dressing that may not have been absorbed by the potatoes. Garnish the salad with sprigs of parsley and serve with cream dressing or mayonnaise.[5]

Variations.—Add any of the following:

a. 1 cupful chopped celery
b. 2 cucumbers, chopped or, as a garnish, sliced
c. 2 hard-cooked eggs, chopped or, as a garnish, sliced

Steamed potatoes

Prepare the potatoes as for boiling. Place them in a steamer, cover tightly, and steam for about thirty minutes, or until tender. Serve them in the same way as boiled potatoes.

Diced potatoes

Cut cooked potatoes in dice of uniform size; season, and sprinkle them with chopped parsley.

Variations.—These variations may also be used for sliced cooked potatoes:

a. Creamed*: Add white sauce.
b. Au gratin*: Put creamed potatoes into a buttered baking dish; cover the top with buttered bread crumbs. Bake until brown.
c. Delmonico*: Arrange creamed potatoes and grated cheese in alternate layers in a buttered baking dish. Cover the top of the dish with buttered bread crumbs, and bake until they are brown.

Riced potatoes

Force cooked potatoes through a ricer or a coarse strainer into a hot vegetable dish. Avoid rehandling in order to keep the potatoes light and attractive in appearance.

Variation.—Brown in a buttered baking dish in the oven.

Mashed potatoes

Thoroughly mash cooked potatoes. Add four tablespoonfuls of hot milk, one tablespoonful of butter, and a little salt and pepper, to each pint of potatoes. Beat the mixture with a fork until light and pile it lightly in a hot serving dish.

Variations.—

a. Cakes*: Shape mashed potatoes into small cakes. Brown them in a frying pan in a small amount of hot fat.

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[5] See page 1553 for recipes for salad dressing.

b. Puff*: Add beaten whites of eggs (2 eggs to 6 medium-sized potatoes). Pile the mixture lightly in a baking dish, and bake it in the oven until it puffs and browns. The yolks of the eggs and grated cheese also may be added.

c. Croquettes*: Add a little chopped parsley and the yolk of an egg (1 yolk to 6 medium-sized potatoes). Shape this mixture into balls; roll them in bread crumbs, beaten egg, and crumbs again; fry them in deep fat.

d. Croquettes en surprise*: Use the recipe given for croquettes, fill the center of the balls with peas, minced chicken, or small frankfurters, before frying them.

e. Potato border*: Spread a wall of mashed potatoes one inch thick around the outside of a buttered pan. Remove the pan, and fill the center with creamed meat or fish. Reheat before serving.

Potato soup

2 cupfuls hot riced or mashed potatoes	2 tablespoonfuls flour
1 quart milk	$1\frac{1}{2}$ teaspoonfuls salt
2 slices onion	Celery salt
3 tablespoonfuls butter	Pepper
	Cayenne

1 teaspoonful chopped parsley

Scald the milk with the onion; remove the onion; add the milk slowly to the potatoes. Melt the butter; add to it the dry ingredients; stir the mixture until it is well blended. Add this to the liquid mixture, stirring constantly, and boil the soup for one minute. Strain it if necessary, add the parsley, and serve.

*Meat loaf**

Riced or mashed potatoes may be very satisfactorily substituted for part or all of the bread crumbs generally used in making a meat loaf. They may also be used with the meat in sausage cakes.

*Codfish balls**

2 cupfuls mashed potatoes	1 egg
$1\frac{1}{2}$ cupfuls shredded codfish (freshened slightly and parboiled until soft)	1 tablespoonful butter
	1 tablespoonful milk

To the mashed potatoes add the codfish, the butter, and the milk. Beat the mixture until light. Add the egg which has been well beaten. Drop spoonfuls of this mixture into a kettle of hot fat, frying not more than six or seven balls at a time. Remove the balls when a delicate brown and drain them on unglazed paper.

Potato stuffing for fowl

2 cupfuls hot mashed potatoes	1 teaspoonful salt
$1\frac{1}{4}$ cupfuls bread crumbs	1 teaspoonful sage
$\frac{1}{3}$ cupful butter	$\frac{1}{4}$ cupful finely chopped fat salt pork
1 egg	1 finely chopped onion

Add to the potatoes the other ingredients in the order in which they are given.

FANNIE MERRITT FARMER

ROASTED POTATOES

Franconia potatoes

Parboil potatoes for ten minutes. Remove the skins and place the potatoes on a roasting rack with meat. Bake until the potatoes are soft, or for about forty minutes, basting them occasionally.

Sliced potatoes

Prepare potatoes as for Franconia. Cut them in one-fourth-inch slices, and sprinkle with a little flour. Put them into a pan containing a small amount of hot fat, and cook them in an oven until evenly browned.

FRIED POTATOES

French fried potatoes

Pare potatoes with as little waste as possible. Cut them lengthwise into eight or ten uniform pieces. Lay these pieces on a towel in order to absorb moisture. Fry in deep fat. Drain on unglazed paper, and sprinkle with salt. Serve immediately.

THE SUBSTITUTION OF MASHED POTATOES FOR PART OF FLOUR

In the following recipes the best results are obtained by the use of freshly cooked potatoes that have been forced through a fine strainer, which makes them more easily blended with the other ingredients than mashed or riced potatoes although these may be used. Cold left-over potatoes may be used but they cannot be mixed with the other ingredients so thoroughly, nor is the flavor so pleasing as when freshly cooked potatoes are used.

Biscuit

1 cupful potatoes	$\frac{1}{2}$ teaspoonful salt
1 cupful flour	1 tablespoonful butter
4 teaspoonfuls baking powder	1 tablespoonful lard

Milk, about $\frac{1}{2}$ cupful

Sift the dry ingredients. Add these to the potatoes, mixing with a knife. Work the fat into this mixture lightly. Add gradually enough milk to make a soft dough. Toss the dough onto a floured board, pat and roll it lightly to one-half inch in thickness. Cut it into shapes with a biscuit cutter. Place the biscuits on greased pans and bake for from twelve to fifteen minutes in a hot oven.

Dumplings

1 cupful potatoes	2 teaspoonfuls butter
1 cupful flour	Milk, about $\frac{3}{4}$ cupful
$\frac{1}{2}$ teaspoonful salt	

Mix and roll out the dough according to directions given for biscuits in the preceding recipe. Place the dumplings close together in a buttered steamer; place the steamer over boiling water; cover it closely and steam the dumplings for twelve minutes.

Muffins

4 tablespoonfuls butter	1 cupful flour
4 tablespoonfuls sugar	4 teaspoonfuls baking powder
1 egg	Salt
1 cupful potatoes	1 cupful milk

Cream the butter and the sugar; add the egg which has been well beaten, then the potatoes; and mix these ingredients thoroughly. Sift the flour, the baking powder, and the salt together, and add them and the milk to the mixture alternately. Bake the muffins in greased gem-pans for from twenty-five to thirty minutes.

Rolls

2 cupfuls potatoes	1 egg
1 tablespoonful lard	1 cupful milk
1 tablespoonful sugar	Yeast
Flour	

To the hot potatoes add the lard, the sugar, and the salt. When the mixture is cool, add the egg and the milk in which the yeast cake has been dissolved. Beat the mixture well; then mix in enough flour to make a soft dough. Put the dough to rise in a greased bowl. When light, turn it out on a floured board and roll it into a sheet one-half inch thick. Cut it into shapes with a biscuit cutter, brush them with melted butter, and fold them over like Parker House rolls. Place the rolls on a greased pan; let them rise; and bake them in a quick oven.

Yeast bread

2 cupfuls potatoes	1 cupful milk
1 tablespoonful lard	Yeast
1 tablespoonful sugar	Flour, enough to make medium dough

Mix the ingredients according to the directions given for rolls, and follow the general rules for bread making.

Doughnuts

4 tablespoonfuls butter	1 cupful milk
1 cupful sugar	3 teaspoonfuls baking powder
2 eggs	Spices, if desired
1 cupful potatoes	Flour, enough to make soft dough

Cream the butter; add the sugar, the eggs, and the potatoes. Then add the milk, and sift in the dry ingredients. Turn the dough out on a floured board. Pat and roll it into a sheet one-half inch thick. Cut out rings with a doughnut cutter, and fry them in deep fat.

RECIPES FOR SALAD DRESSING

Mustard dressing

1 tablespoonful cornstarch	3 eggs
1 tablespoonful mustard	½ cupful vinegar
1 teaspoonful salt	½ cupful water

Scald the vinegar and the water. While hot, pour them slowly over the other ingredients, stirring the mixture well. Cook the mixture over hot water until it is thick, stirring it constantly.

Whipped cream dressing

½ cupful vinegar	1 teaspoonful salt
2 teaspoonfuls sugar	2 eggs or 4 egg yolks

1 cupful heavy cream

Beat the eggs until they are well broken and add to them the vinegar, the sugar, and the salt. Cook this mixture over hot water until it thickens. Cool it, and when cold add the cream, which has been whipped.

German salad dressing

1 cupful cream (sweet or sour)	½ teaspoonful salt
1 tablespoonful vinegar	¼ teaspoonful paprika

Whip the cream until it is stiff. Add the other ingredients slowly. The dressing is then ready to serve.

Quick mayonnaise dressing

1 egg	1 teaspoonful salt
1 to 2 cupfuls oil	$\frac{1}{8}$ teaspoonful cayenne pepper

1 tablespoonful vinegar

Break the egg into a small, deep bowl. Add to the unbeaten egg three tablespoonfuls of the oil and all the other ingredients. Beat this mixture vigorously with a dover beater for two minutes. Continue beating while the remaining oil is being added. Add sufficient oil to make the dressing stiff enough to stand. If only the yolk is used, less oil will be required to make a stiff dressing. This dressing may be kept for a week or two if it is kept cool. An equal quantity of whipped cream may be added as the dressing is used.

Boiled mayonnaise dressing

4 eggs	Red pepper
2 tablespoonfuls sugar	1 teaspoonful salt
1 teaspoonful mustard	$\frac{2}{3}$ cupful vinegar

1 cupful oil

Beat the yolks of the eggs and add to them the sugar, the mustard, the red pepper, the salt, and the vinegar. Add the oil, and the whites of the eggs beaten until stiff. Cook the mixture over hot water until it thickens, stirring it constantly. Do not cook it too long.

Cornstarch thickening in mayonnaise dressing

4 tablespoonfuls cornstarch
$\frac{1}{2}$ cupful vinegar
$\frac{1}{2}$ cupful water

Dissolve the cornstarch in a small amount of the water, add the remainder of the water and the vinegar. Cook the mixture until it becomes thick and clear. While it is hot, add it to mayonnaise dressing in the proportion of one part of the cornstarch mixture to two parts of mayonnaise. This makes a less oily dressing than mayonnaise alone, and for this reason is sometimes preferable.

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SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 81 FEBRUARY 1, 1915 FOOD SERIES No. 15

POTATOES IN THE DIETARY

DISCUSSION PAPER

By means of the discussion papers we have an opportunity to become acquainted. We shall take it as an indication on your part that you are interested if you answer the questions and return them to us. The staff of the Department of Home Economics is ready to assist in your study of scientific home-making. We want your assistance as well. Ask questions, offer suggestions, let us have the benefit of your experience. You thus become a vital part of the Department of Home Economics in its effort for scientific housekeeping.

Will you please send your opinions on the following points to the Supervisor of the Cornell Reading-Course for the Farm Home?

1. What reason, if any, have you for using potatoes more extensively at the present time than in the past?

2. What method of cooking potatoes have you most commonly used?

3. In what ways have you used potatoes as a substitute for wheat flour before this bulletin reached you? Give any good, tested recipes you may have.

4. If potatoes are the most common vegetable in your family dietary, what have been your reasons for including them?

Name ....

Address ....

Date ....

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VOL. IV. No. 83 MARCH 1, 1915 GARDEN SERIES No. 3

RAISING VEGETABLES FOR CANNING

ALBERT E. WILKINSON

The interest in canning has increased so remarkably in recent years that almost every housewife is familiar with the canning process. Many desire more information, however, and in order to meet this need a country-wide movement has developed. Canning clubs have been and are being

FIG. 1.— *Growing beans for canning*

formed in many sections, and children, especially girls, are encouraged to join. This movement has resulted in a wider knowledge of modern methods. At the same time, knowledge regarding the growing of vegetables for canning is much needed, for, in order to obtain a good canned product, it is necessary to grow vegetables that are the best. To this end, certain definite work must be performed, and certain favorable conditions must be provided; growers who are willing to study these factors and to follow the best practices are able to offer a better finished product. The character and the general requirements of the leading vegetables that are grown for canning are discussed in this lesson.

BEANS

The bean, one of the oldest and most useful of the vegetables grown for human food, has been a well-known crop in New York State from very early times.

Site.—Farmers are likely to plant beans on sites unsuited to their best growth. For example, in some sections, beans are placed on thin hilltops and dry knolls; this is a mistake, because beans require good soil for their best development. For early maturing varieties, a southern exposure is preferable, though if a poor northern exposure or a hilltop is the only site available, certain soil improvements may be made, by the addition of manure or fertilizer and by the proper rotation of crops, which will counteract the influences of a poor site.

Soil and its preparations.—Beans will grow, however, on a variety of soils, though profitable bean growing requires good, fertile soils well adapted to the crop. Leguminous plants seem to be partial to limestone soils, and beans are no exception to this rule. Soils possessing a great abundance of organic matter are undesirable, as they produce a rank growth of vine and a corresponding decrease in the crop yield. Gravelly loams, containing considerable amounts of fine silt and some humus, with an application of fertilizer, will grow profitable crops of beans. Moderately heavy clay loams may also be favorable for their growth, if well drained and supplied with humus. Very heavy clay and very light sandy soils are less suitable. A medium loam is probably the best. Land that will produce good corn or good wheat will produce beans, though beans will not thrive on as heavy a soil as wheat will, nor on as light a soil as corn. Early plowing is essential to best results with beans. As the seed is not to be planted until late spring, the average farmer delays plowing until the latter part of May, much to the disadvantage of the crop. The soil should be plowed five or six weeks before the time of planting and should receive frequent harrowings to bring it into the best possible condition. The plowing should be as deep as possible, and the harrowing should be very thorough, because this treatment retains a larger amount of moisture in the subsoil to become available for the use of the plants later in the season. More frequently than otherwise, the crop suffers for moisture at some time during the season, and the early plowing and the thorough tilling are the best means of guarding against this.

Rotation.—Beans seem to fit naturally into ordinary farm crop rotations. They follow corn or potatoes to advantage. In some cases beans have been successful on freshly turned sod land. In rotation, the bean crop exhausts the soil less than most others, and it is noticeable that crops following beans are benefited, due no doubt to the nitrogen-gathering bacteria of the root nodules of the beans, in common with other legumes.

Manure and fertilizers.—If the crop preceding beans has been heavily manured or if a clover crop has been plowed under, the addition of manure may not give as good results as the use of commercial fertilizers, because the use of too much manure is followed by an overproduction of leaves and stems. Where manures have not been used, an application of from eight to ten tons of manure per acre, preferably well rotted, will prove satisfactory. Manure should be broadcasted in the fall or whenever made.

A 1-8-3 or 1-8-4 commercial fertilizer gives good results. Sometimes one hundred and fifty pounds acid phosphate per acre will give very good results on land in good tilth, though where the land is decidedly poor and when nothing but commercial fertilizer is available, it may be advisable to use from three hundred and fifty to five hundred pounds per acre of a 2-8-10 fertilizer. The fertilizer, if used in small amounts, should be placed in the drill.

Varieties.—A great many varieties are listed in the seed catalogues, and with beans, as with other vegetables, seeds vary from different seedsmen. Some seedsmen have specialized in developing certain sorts, and it is usually advisable to buy from such seedsmen, and thus gain the advantages derived from their special study. Some seedsmen are introducing new varieties, which may well be tried out in a limited way until their worth can be proved for the individual. For the green type of dwarf beans, Stringless Green-podded Valentine, Refugee, and Bountiful are very good sorts. Desirable pole beans of the green type are: Kentucky Wonder, White Creaseback, and Lazy Wife's. Wardwell's Kidney Wax, Refugee Wax, Saddleback Wax, Golden Wax are good types of dwarf wax beans; Kentucky Wonder Wax and Golden Cluster are desirable pole beans of the wax type. These lists do not begin to exhaust the possibilities, and other varieties may prove just as satisfactory in certain locations. Where shell beans are in demand, Red Kidney, White Marrowfat, Horticultural, and Goddard Horticultural are desirable.

Climate is a deciding factor in the growing of lima beans, because most varieties require a long growing-season. Limas also prefer a more sandy soil, which must be well supplied with plant-food and humus. In western New York, Henderson, because of its hardiness and earliness, seems to be most commonly grown for canning purposes. Other good sorts of bush limas are Burpee-Improved, Fordhook, and Dreer's Wonder. Of the pole types, Carpenteria, King of the Garden, and Leviathan are good.

Time and methods of planting.—The time of planting varies somewhat with the locality, but mainly in accordance with the variety of beans grown. Some of the sorts mentioned are hardier than others, and hardiness may be readily tested by the grower for a specific locality. As a

general rule, however, early planting is not to be recommended. The seeds rot quickly if the soil is too cold or too wet for quick germination, and even though there is a fair stand, the young plants do not get an even start because the stronger seeds start first and the weaker ones later. If planting is delayed until the soil is thoroughly warmed and in condition to produce quick germination and rapid growth, an even start is obtained, and a large number of pods or seeds may be harvested at each picking.

Nearly all growers plant beans, except limas, in drills, which are about twenty-eight inches apart, though the distance varies from twenty-four to thirty-two inches. Lima beans are planted in drills from three to four feet apart. If the beans are to be cultivated with hand tools, the drills may be less than twenty-four inches apart. It is important that the rows should be straight and that the seeding should not be too thick. From four to eight seeds per foot of row is enough. If comparatively small plantings are made, the well-known planters operated by man power are used, and they may be adjusted to plant the beans in drills or in hills at the required depth, about one to one and one-half inches. If plantings are made on a large scale, the ordinary grain drill is widely used, especially for planting the smaller varieties, by closing some of the tubes. In some cases special bean planters are used, particularly for lima beans and other large sorts. The amount of seed required per acre varies slightly with the variety — for pea beans from two to three pecks is the correct amount, for kidney and other similar beans from five to six pecks, and for lima beans six pecks. If the seed has strong germinating power, and if the soil is in prime condition, it is evident that a smaller amount of seed is required to get a good stand than if the seed is poor and soil conditions less favorable. If the hill system is to be used, from three to five seeds should be dropped from every twelve to fifteen inches in the row. On a small plot, which is to be worked by hand, the hill system may be adopted, and the rows may be only eighteen inches apart.

Cultivation.—If soil conditions are favorable, beans come up quickly, and cultivation may begin as soon as possible. When the young plants first appear above ground, they are tender and break easily; therefore care should be used in working among them. The culture required by beans is similar to that of other intertilled crops. Cultivation should be frequent enough to keep the weeds from starting and a crust from forming on the surface of the soil; for in this way, moisture that was held in the soil by early plowing and harrowing may be conserved. Cultivation should be shallow because the bean roots are relatively surface feeders. Beans should not be cultivated while their leaves are wet with dew or rain, for at that time disease may be carried by the tools from plant to plant and from field to field. On small patches man-power tools may be used,

but shallow cultivation may be done with horse-power tools if they are handled properly. For this purpose they should have eleven or twelve small teeth. Between the plants in the row or between the hills, the hoe should be used in order to break the soil just under the surface and to destroy weeds at the same time. Some persons prefer to use the light onion hoes, so that they may work quickly and easily near the plants.

For climbing beans, poles should be erected or a trellis constructed. A single pole from five to nine or ten feet high should be set in the center of each hill, or a trellis may be made of chicken wire four or five feet high or a system of strings running from one wire to another.

Diseases and their remedies.—There are a number of diseases affecting the bean in New York, and the most destructive of these is the bean anthracnose, though the bean blight often causes considerable loss. In order to avoid anthracnose, only clean seed, obtained by selecting seed from pods free from the diseased spots, should be planted. Hand sorting of seed and seed treatment will not control this disease, but spraying the plants thoroughly by hand with bordeaux mixture 5-5-50 is a good remedy. The plants should be sprayed three times: first, when they break through the ground; second, when the first pairs of leaves are unfolded; third, when the pods have set.

Blight affects the leaves chiefly, forming large dead spots. Spraying with bordeaux mixture, as for anthracnose, is said to reduce the injury.

Insect pests and methods of control.—The principal insect enemy of the bean in New York State is the bean weevil. This pest proves very destructive when attempt is made to grow beans in the southern counties of the State, but ordinarily it does little damage in the northern counties. As a means of controlling this insect, the bean seed should be treated in the following way: Place two or three bushels of beans in an ordinary tight barrel, such as an oil barrel, and pour over them six ounces of bisulfide of carbon for each bushel of seed. Close the top of the barrel with a tight-fitting head, seal it by covering the top with moistened newspapers, and leave it thus for forty-eight hours. Bisulfide of carbon is highly explosive, and care should be exercised not to have lighted cigars, pipes, or matches near the barrel. After the beans are removed from the barrel, they should be tested in water before they are planted. All good seeds will sink, but those infested with weevil will float.

Harvesting.—Beans should not be harvested when the pods are moist, for this is conducive to the spread of anthracnose on the pods. Beans should be harvested when they are of the proper size and are tender. If the small, or French, beans are desired for canning, the pods should be picked when very small, three-sixteenths inch in diameter and from two to three inches long; otherwise, harvesting can be delayed until the pods

are larger. Beans are tender when the pods will break with a snap and when there are no strings. Lima beans should be harvested when the seeds are of larger size, but before they become too hard. Beans should be picked with the least possible injury to the pod and the plants, for it should be remembered that the plants are tender, living things, and they should be treated as such. Beans may be put into any convenient receptacle as they are being picked, but a basket holding a peck or a half bushel is very serviceable. One picking may be followed by another in a very short time, and with some varieties of beans two pickings are all that can be made satisfactorily. After the frost has killed the plants, the patch

FIG. 2.—*Harvesting snap beans*

should be cleaned up either by plowing or by burning or composting the weeds and vines.

Yields.—Green, or snap, beans yield from seventy-five to one hundred and twenty bushels per acre, lima beans, not shelled, from seventy-five to one hundred bushels, and shell beans from ten to twenty-five bushels.

BEETS

The most valuable part of the beet plant is its root, which, in order to be of high quality, must be tender, smooth, and symmetrical. These high qualities are produced by rapid growth in a deep, rich, loose soil during a cool season. If the soil is very hard or shallow, the roots are short, have a tendency to branch, and are irregular in form. In growing beets good tilth is an important factor, for it produces quick growth. Beets are rather hardy and relatively easy to grow.

Soil and its preparation.—The best soil for beets is a sandy loam that contains a large amount of plant-food in the form of humus from well-rotted manure or from green crops plowed under. Manure, if used, should be applied at the rate of about ten to fifteen tons or more per acre, and should be well rotted, for fresh manure has a tendency to increase scab.

The soil should be plowed as deeply and as thoroughly as possible—from six to seven inches is none too deep—and it should be harrowed very frequently until it is fine. Some growers practice the back-furrowing method of preparing the ground, which is as follows: The soil is plowed in the fall or very early in the spring to the depth of from six and one-half to seven inches or more, and, after a short time and just before the crop is planted, it is plowed a second time four inches deep. It is better to begin the plowing in the middle of the garden or the field. The furrows should be thrown against each other, that is, as the plow moves from north to south, the first furrow is thrown toward the west, and as the plow returns from south to north, the second furrow is thrown toward the east, or against the first furrow. Hand raking may be begun after four furrows have been turned, and all coarse material should be raked into the dead furrows. If the work of plowing and raking has been done carefully, the topsoil to the depth of four inches will be in fine condition for planting or cultivation. Back furrowing is one of the best intensive methods of crop production, and, although it is expensive, it is justified by the returns received from the crops grown. If back furrowing is not practiced, and if very fine soil is desired, plowing may be followed by harrowing with the disk, the spike-tooth, and the Meeker harrows, which will level and fine the soil and leave it in good condition for planting.

Varieties.—Probably the variety of beets grown more for canning than any other is Detroit Dark Red; however, Crosby Improved Egyptian and Edmand's Blood Turnip are good sorts for this purpose. Just as in the case of bean seed, there is a variation in the beet seed from different seedsmen, for some give special attention to the improvement of this crop. In buying seed, growers should take advantage of this work in seed selection.

Time and methods of planting.—Owing to the fact that most persons wish to do all their canning at one time, it is sometimes advisable not to plant beets until late in the spring. They may, however, be planted any time from May to August. They are ready for use from sixty to eighty-five days after planting, and the date of planting should be governed, therefore, by the time one desires to can the beets..

Beet seed is generally sown in drills. If the beets are to be cultivated by horse power, the rows should be from twenty-four to thirty-six inches apart; but if they are to be cultivated by hand, from twelve to twenty-four inches is sufficient. In both cases the seed should be planted not

deeper than one inch, and one-half inch is deep enough if soil conditions are right. The rows should be marked out straight with a common home-made marker or with stakes and line.

Beet seed may be planted with one of the man-power planters, which will regulate the depth and the replacement of the soil over the seed. These planters will work efficiently only when the soil is thoroughly prepared. The use of machines for planting is discussed in *Planting the Home Vegetable Garden*, Reading-Course for the Farm, Vol. III, No. 58. If one of these machines is not available, the seed may be planted by hand. The rows should be marked out with stakes and line, and the furrows should be opened with a hoe, which should be used to cover the seed and firm the soil over it. If beet seed is planted by hand, it may be soaked overnight in lukewarm water, thus hastening germination.

When the plants are from three to five inches tall, they should be thinned so that there are from four to six plants to every foot of row. The leaves of these young plants make very good greens. As a rule, each so-called seed contains more than one real seed, and this fact may account for an over-thick stand of beets.

Cultivation.—Beets should be given frequent but shallow cultivation, for they are surface feeders. The soil should be kept free of weeds, and moisture should be conserved by preventing the formation of a soil crust. If beets are cultivated by horse power, the best tools to use are those with small teeth, such as the twelve-point cultivators; and if they are cultivated by hand, any of the several good man-power cultivators may be used. With the latter tools it is possible to cultivate very close to the rows, thus eliminating to a very large extent the tedious work of hand weeding. The hoe should be used two or three times during the season in addition to the cultivator, in order that all weeds in the rows may be destroyed.

Insect pests and methods of control.—The beet leaf-miner sometimes causes great loss by destroying the leaves. The best method of control is to cut out and destroy the leaves containing miners. Another method is to eradicate pigweed, for it furnishes a breeding place for the leaf miner. Cutworms occasionally do considerable damage to beets, but they may be controlled by placing poison bait, consisting of bran, molasses, and some arsenical poison, along the rows of beets.

Diseases and their remedies.—Scab, similar to potato scab, is sometimes prevalent on beets. The most satisfactory remedies are rotation of crops and planting beets in acid soils.

Harvesting.—The following method is used in harvesting beets. They are pulled from the ground, and the tops are twisted or cut off an inch or so from the crowns. It is important that a small part of the leaf stems

should be left on each beet in order to avoid bleeding, which would injure the appearance and the quality of the root. For canning purposes small beets are generally required, and it is therefore necessary to harvest them when rather young. It must be remembered that beets are tender plants and should not be injured, but should be handled with care and taken from the field or garden and washed as soon as possible after they are pulled. Leaves trimmed from beets should be gathered together and placed in the compost pile or destroyed.

Yields.—Beets yield from four hundred to seven hundred bushels per acre.

SWEET CORN

Soil and its preparation.—Sweet corn seems to be cosmopolitan as far as soil conditions are concerned. It thrives best, however, in a fairly rich loam, and it is not advisable to plant it in soil that is too hard or clayey and therefore rather backward. Sandy or gravelly loams or even a silty loam, if they are deeply tilled, will produce good sweet corn. In crop rotation, corn may follow any other crop, but as a general thing, it is grown where sod, preferably clover sod, has been plowed under.

The ground should be plowed deeply early in the spring, from six and one-half to seven inches or even deeper. Care should be taken not to mix too much of the new subsoil with the topsoil, from one to one and one-half inches being sufficient in any one year. Following the plowing, the ground should be harrowed thoroughly, that is, three or four times rather than once. Good practice is to harrow twice with a disk harrow and several times with a spike-tooth harrow. If the land is plowed early, especially sod land, and thoroughly harrowed, a larger amount of moisture will be conserved, particularly if harrowing follows soon after rain, than if the plowing and harrowing is done at a later time.

Manures and fertilizers.—If manure is used, it should be applied broadcast at the rate of from ten to fifteen tons per acre. If possible, it should be well rotted, though corn is less injured by fresh manure than some other garden crops. If the soil is of a relatively heavy type and backward, high-grade fertilizer in addition to manure may be applied to good effect at the rate of from two hundred and fifty to five hundred pounds per acre. If manure is not available, a fertilizer containing two per cent nitrogen, eight per cent phosphoric acid, and ten per cent potash will give satisfactory results if applied in the hill at the rate of about five hundred pounds per acre. This fertilizer produces better results if used on soil where sod has been plowed under than if used on bare ground.

Varieties.—In the eastern United States, the variety of corn used for canning more than any other is Crosby Early, which is a second early variety among the named sorts in time of maturing. It has an ear of fairly large

size and very choice kernels, and, owing to its earliness, the grower is practically assured of obtaining a crop. Stowell's Evergreen, which bears very large ears and white kernels of high quality, is the standard late corn for canning purposes. However, in the last two or three years, owing to the early frosts in the fall and the length of season required to mature this variety, it has proved a failure in this State. Country Gentleman is a good type if shoe-peg kernels are desired, for the ears are fairly large and the kernels are deep and placed irregularly on the cob. Where the length of the growing season must be considered, it is better to plant the early rather than the late sorts for canning purposes. It is well to take advantage of improved types of seed.

Time and methods of planting.—Corn should not be planted too early in the spring, or, as a general rule, while there is danger of frost; the best time is probably from May 15 to June 1 or even a little later in some localities. By that time the soil should be warm.

If the seed is to be planted by hand, the following method may be used: After the rows have been marked out in some way, small holes should be dug with a hoe where the hills are to be located. Fertilizer may be placed in these holes, and, if so, it should be covered with a little soil before the seed is dropped. After the seed is covered, the soil should be firmed over it with the hoe or the foot. If man-power planters are used, fertilizer has to be broadcasted. If the horse-power corn-planter is available, this may be utilized. It plants the seeds and distributes the fertilizer at the same time. It is sometimes advantageous to use the hand method of planting corn, for then the patch may be marked out in rows running at right angles, and the corn planted at the intersection of these rows. It is then possible to cultivate on every side of a hill of corn, and the amount of hand hoeing, if indeed any is necessary, is decreased materially. If corn is to be cultivated by horse labor, the rows should be from thirty to forty-two inches apart, and the so-called hills from eighteen to thirty-six inches apart in the row. Five or six seeds should be planted in a hill, but the young plants should be thinned so that only three strong stalks remain in each hill. If the corn is to be cultivated by hand labor, the rows may be somewhat closer together, from eighteen to twenty-eight inches apart, but the hills should be from eighteen to thirty-six inches apart in the row. In some instances, corn may be planted in rows and later thinned so that the stalks are one foot apart. The seed should be planted not deeper than one and one-half inches, and one inch is even better. Some kind of marker should be used to make the rows straight, or if the planting is a small one, stakes and line may be used.

Cultivation.—Corn should be given clean but shallow culture, for corn roots are relatively surface feeders. For this work a good horse-power

cultivator is the twelve-point, which has fine teeth made in such a way that they will not dig deeply into the soil. For hand tools, there are many wheel-hoes. Besides these tools, the hand hoe is recommended, especially for work close to the plants.

It is advisable to remove the suckers that spring up around the base of the stalks, for they tend to decrease the productiveness of the plants. Corn is a hot weather plant and thrives best in the fullest exposure to sunlight. It is not able to withstand drought so well as many other crops; therefore conservation of moisture by maintaining a dust mulch is essential.

An insect pest.—The corn-ear worm, or bollworm, is injurious to sweet

FIG. 3.—*Pole lima beans, growing under favorable conditions*

corn in several sections of New York State, but no satisfactory means of control has been found.

A disease and its remedy.—The same smut that attacks field corn is found on sweet corn. The following remedy for this disease is recommended: Plant corn on soil free from the disease, do not use manure containing smutted fodder for this crop, and destroy any portions of the plant found diseased.

Harvesting.—When the silk at the end of the ear of corn has become dried and brown, the corn, as a rule, is ready for harvesting; but this is not always a reliable indication. If the ear appears plump and mature, it is ready to harvest; but if a person is not experienced in judging these appearances, it may be best to open the husk far enough to look at the kernels. They should be in the milk stage, plump, dull white — not glossy —

and soft. Sweet corn should be harvested carefully so that the stalks are not broken as the ears are severed from them, and so that the kernels are not pressed too hard. After all the corn has been harvested from the entire plot or after there have been killing frosts, the stalks should be cut down and the garden made as attractive as possible. The stalks may be fed to stock, composted, or destroyed.

Yields.—Sweet corn can be made to yield per acre from eight to nine thousand ears, or from two and one-half to five tons of husk, cob, and kernels.

PEAS

Peas, which are native to Europe as well as many sections of the United States, have been cultivated for centuries; they were, in fact, commonly grown by the early Greeks and Romans. In this country, peas are most generally grown in the northern states, for they thrive in a cool, moist climate.

Site.—The best site for the late varieties of peas is a northern exposure, because it is cooler and more moist than any other location. The early varieties, however, should be planted on a southern exposure, for the grower must sacrifice a small amount of the yield in order to obtain early maturity.

Soil and its preparation.—The writer has found by careful observation that a nonacid clay soil or a silty loam is best for the late varieties of peas, whereas a sandy loam is seemingly best for the early sorts. Muck soils have an abundance of moisture and a relatively cool temperature; however, they are not as a rule desirable for growing peas, because they produce a rank growth of vines but a limited amount of pods. The very light sandy soils are not suitable, because they produce neither thrifty vines nor pods of good size.

As a rule, peas should be grown on different soil each year. If an acre or more is planted, they may follow sweet corn, cabbage, potatoes, or some other cultivated crop. In the garden, peas may be planted after root crops or other crops that have been weed free.

For peas heavy soil should be plowed in the fall and lighter soils, such as sandy or gravelly loams, in the spring. In either case, the ground should be thoroughly harrowed and smoothed a short time before the seed is planted. A disk harrow is adapted for use on heavy soil, and either a spring-tooth harrow or a spike-tooth harrow for use on light soils. The preparation of the seed bed for this crop is very important.

Manures and fertilizers.—For peas the soil may be oversupplied with nitrogen and humus, and stable manure must be used sparingly. As a rule, it had better be applied the year previous on some other crop.

There is rarely too much available potash and phosphoric acid in soil for peas; wood ashes and well-composted hen manure will supply these

ingredients with very good results. It is better to apply these substances separately, and they should never be mixed together any length of time before they are used. A commercial fertilizer suitable for this crop should contain one per cent nitrogen, from six to eight per cent phosphoric acid, and from five to seven per cent potash, and should be broadcasted at the rate of from three hundred and fifty to five hundred pounds per acre. In some cases where the soil was very rich, a half-and-half mixture of potash and phosphoric acid broadcasted at the rate of from four hundred to five hundred pounds per acre has given good results.

Inoculation.—The inoculation of soil to which leguminous plants are not native or on which they grow only in a limited way, has been found to produce an increased number of nodules on the pea roots, but no very striking benefit to the pea crop itself. However, the benefit comes to the crop following the peas. Inoculation of the soil for peas may be tested on a limited area, by the same method as that used for clover, alfalfa, or other legumes.

Varieties.—For canning, Alaska is one of the most common early varieties, though it is not of high quality. Good sorts maturing a little later than Alaska are Surprise, Gradus, Thomas Laxton, McLean's Advancer, Duke of Albany, and British Wonder; good late maturing varieties are French Canner (*Petit Pois*), Everbearing, Champion of England, Telephone, Stratagem, and Carter's Daisy, or Dwarf Telephone. For a succession, Alaska could be planted first, followed by Surprise, Thomas Laxton, and Duke of Albany. There are many other sorts good for canning, and it is recommended that they be tested whenever practicable.

Good pea seed, which is essential to the production of a good crop, may be bought from growers or seedsmen whose pea seed is produced in New York, New England, other northern states, or Canada. As a rule, pea seed produced in the northern sections of the United States and in Canada is to be preferred to seed produced in the southern part of the United States. Seed from reliable seedsmen who have made a specialty of certain varieties should be bought in preference to the ordinary run.

Time and methods of planting.—The time for planting peas will vary somewhat according to the locality and the variety selected, but the general rule is to plant them as soon as the soil is in condition in the spring, which generally means from April 20 to May 15 in this State.

Peas should be planted from one and one-half to two inches deep. If they are planted three or four or more inches deep, it is likely that the small seeds will be unable to thrust stalks and leaves through this amount of soil and make the proper growth. Sometimes nature will overcome this difficulty, but if it is desired to plant peas three or four inches deep, the following method may be used: Sow the peas in a trench three or

four inches deep, but cover them with only an inch of soil. After the seedlings come above the ground, gradually draw the soil towards them, and continue to do this as the plants grow, until the trench is filled.

Peas grown on a large scale for canning purposes are generally sown with a grain drill. The old practice was to sow them in drills running but one way across the field, using from two to three bushels of seed to the acre; the more modern practice, which gives better results, is to plant half the peas in drills running lengthwise of the field and the other half in drills running crosswise, using at least four bushels of seed to the acre. A more uniform stand and a larger yield are thus obtained. If a grain drill is not available, peas may be sown by hand and harrowed into the soil, which in this case should be in very fine tilth and weed free. In a small garden, the one-row seeder may be used, and, if so, the seed should be planted from one to two inches deep in rows from twelve to eighteen inches or more apart, according to the habits of the variety used.

The amount of seed to plant varies from two to six bushels per acre according to the soil and the variety. In general, four bushels per acre is the best amount, but if the peas are grown in a small garden and the pods hand picked, six bushels may be necessary.

Cultivation.—If peas are sown with a grain drill or broadcasted, no cultivation is possible; therefore, in that case, the preparation of the ground should be most thorough. If they are planted in rows that are some space apart, cultivation should begin soon after the plants appear above the ground and should be repeated very frequently. Some persons think it advisable to cultivate peas at least every five days. It is important to conserve all moisture possible in the soil, for this crop requires four hundred and seventy-seven pounds of water to produce one pound of dry matter. Shallow cultivation will give the best results, because the roots of this plant come very near the surface of the soil and spread so far that deep cultivation would injure them seriously.

In home gardens, where tall-growing varieties of peas may be desirable, some form of a support is necessary. Brush, chicken wire, or a trellis made with strings will be found satisfactory.

Insect pests and methods of control.—Pea weevil is one of the most common pests, and the method of control is the same as that given for bean weevil on page 1563.

The annual loss caused by pea louse is very large. On small plantings, this insect may be controlled by spraying the plants with a ten or twelve per cent solution of kerosene emulsion or a solution of nicotine, laundry soap, and water, mixed in the following proportions — three-fourths pint nicotine, five pounds laundry soap, and one hundred gallons water. Many birds and insects are the natural enemies of the pea louse. During the

summer of 1912 the writer saw the work of the swallows and the martins, which destroyed millons of these insects on his patch of peas. Another method of controlling this pest is to cultivate the peas immediately after a person has gone along the rows and knocked the insects from the vines; in this way they are buried by the cultivator.

A disease and its remedy.—Mildew is a whitish or grayish coating generally found on the leaves late in the season and after the weather has become somewhat warm; the remedy for it is dusting with sulfur the plants that are affected. Peas grown on cool sites are less likely to be troubled with this pest.

Harvesting.—As soon as the pea pods become filled with seed, the vines should be cut. This may be done with a scythe or a mowing machine. If the latter is used, the vines may be collected in small piles with an ordinary hand rake, and these piles may be combined with a fork into larger ones, which are thrown on a wagon, If peas are raised on a large scale, it would be advisable to own a pea swather for harvesting the crop. The swather lifts the vines with long finger guards, which are placed on the cutter bar; cuts the vines with specially constructed knives, and throws them to one side in a swath. Under favorable conditions ten acres of peas can be harvested per day by this method. The vines should then be collected in wagons and taken from the field to the cannery without delay.

If peas are grown on a comparatively small scale, they are generally picked from the growing vines by hand into baskets and carried to the house for canning. Care should be taken not to injure the pods or the vines. The average price for picking a bushel of peas by hand varies from fifteen to twenty-five cents according to the labor supply and the heaviness of the yield. If peas are to be held in the pod for any length of time, they should be kept cool, for they heat very quickly.

Yields.—This crop often yields from fifteen to twenty-five hundred pounds of shelled peas per acre and under very favorable conditions as high as two tons per acre on plantings of one acre or more. The average yield for the garden of less than one acre is from seventy-five to one hundred and fifty bushels of unshelled peas per acre, according to the method of planting and the variety grown. In a garden of less than an acre, a row about one hundred feet long will yield from one to three bushels of unshelled peas. Canneries pay from two to two and one-half cents a pound for shelled peas. Oftentimes the small gardener will sell the earliest peas for immediate consumption at from one to three dollars a bushel, and after the price has dropped to less than a dollar he will use them for canning purposes. On plantings of more than an acre, the cost of producing an acre of peas for canning varies from thirty to forty-five

dollars, and the profit varies from fifteen to twenty-five dollars or more per acre if conditions are favorable or if good methods of culture are used. In the small garden where but one acre or less is raised, and some of the peas are sold as a green vegetable, the cost ranges from forty to seventy-five dollars, according to the method of planting and the yield, and the profit varies from fifty to seventy-five dollars. In the small garden, after peas have been harvested, another crop may often be grown on the same soil during the remainder of the summer.

SPINACH

Spinach is one of the most important crops grown for greens in the United States.

Soil and its preparation.—For spinach, rich, sandy loams are satisfactory for the early spring crop, and muck soils after being subdued are especially adapted to the early summer or fall crop. Poor soils that dry out can be improved by applications of humus-making material. As this crop is relatively hardy, it can be grown where the temperature falls rather low in the spring. This plant will not grow on a soil that is in a highly acid condition. It is therefore very important that lime should be used.

Soil for spinach should be plowed deep, and harrowed and smoothed until the topsoil to the depth of four inches is in very fine condition and level on the surface. The more thorough the preparation is, the better will be the crop. Muck soils should be "planked" before the spinach is planted.

Manures and fertilizers.—Composted manures are of the greatest value with this crop on soils other than muck, as they bring about the best conditions of the soil. These manures should be applied in the spring at the rate of from twenty-five to fifty tons per acre, depending on the condition of the soil.

If the crop preceding has been fertilized very lightly, a fertilizer containing two per cent nitrogen, five per cent phosphoric acid, and seven per cent potash, if broadcasted on the soil before the spinach is planted, will give good results. Spinach requires no additional fertilizer if it is grown in rotation on muck soil and follows a crop that has been heavily fertilized. Care must be taken not to oversupply nitrogen.

Rotation.—As spinach is a crop that requires only a short period to mature, it can be used advantageously in rotation with other crops. All crops preceding spinach should be kept free of weeds. Good rotations are: spinach followed by late celery the same year, onions, and spinach; or spinach and tomatoes; or peas and spinach. On soils other than muck, manure or clover should play an important part in the rotation, on account of the humus that is derived from them.

Varieties.—Some of the best varieties of spinach are Victoria, Long Standing, Giant Thick Leaf, and Savoy Leaf. The seed of spinach is so cheap that very little attention has been given to producing high quality strains.

Time and methods of planting.—In New York State fall plantings of spinach should be made during August; spring plantings as soon as the ground is ready, which is probably during April. For fall harvesting, spinach should be planted about the fifteenth of July.

In some localities, especially near cities, spinach is planted on soils other than muck in the fall in beds consisting of four or five rows from ten to fourteen inches apart. The seed should be planted from one-half to one inch deep, and a one-row drill operated by man power or a larger drill that will sow four or five rows at a time may be used. If spinach is planted in the spring, particularly in muck soils and other good garden soils, raised beds are not made because drainage is generally not necessary during the summer months, but seed is planted from one-half to one inch deep with a one-row drill in rows from ten to fourteen inches apart. Spinach should be planted at the rate of from fifteen to thirty pounds of seed to an acre, and some growers use as much as from forty-five to fifty pounds per acre. If the seed is sown in upland soils, it may be necessary to thin the plants in order to obtain the best growth. There should be from four to six inches between each plant, for if the rows are from ten to fourteen inches apart, the plants will soon spread and cover this entire space. Spinach planted on muck soils is not thinned.

Cultivation.—Spinach should be cultivated every four or five days during the early stages of growth, for it soon grows and covers the ground, and cannot be tilled. One of the wheel hoes operated by man power or a scuffle hoe is a good tool to use for this work.

Insect pests and methods of control.—Early in the spring this plant is not troubled very much with insects, but during the early summer the two following pests may become serious.

The leaf miner affects the spinach in the same way that it affects the beet, and the same methods of control should be used (page 1566).

There is a green fly, or aphis, that injures spinach by checking its growth. No effective method of controlling this insect has been found, but rain or cold weather hinders its progress, and if the plants are kept in thrifty condition they are less likely to be injured.

Harvesting.—Spinach should be harvested when the plants have grown to large size and have completely covered the ground. In a soft soil, such as muck, a wheel hoe or a scuffle hoe can be used to cut the root just below the crown, or if particular care is required, a good knife may be used. In the harder soils, such as the gravelly loams, a butcher knife

is the best implement. Spinach should be harvested with as little injury to the plants as possible. As soon as it has been cut, it should be placed in baskets, taken to the house, washed, and placed on a rack to drain. It is then ready to be prepared for canning.

Yields.—Spinach often yields from two to two hundred and fifty barrels per acre, four to six tons, if it is grown on sandy or gravelly loam, or from seven to ten tons if it is grown on muck soil. In a small home garden, a row one hundred feet long should yield from two to four bushels, according to the cultivation given.

TOMATOES

The tomato, one of the vegetables most commonly grown for canning in the United States, requires a long, warm season for its best development.

Site.—The best location for a field of tomatoes is a southern slope, where there is sufficient air drainage to insure the tomatoes from injury by light frosts. Tomatoes will grow fairly well on less suitable sites in favorable seasons, but considerable risk is involved.

Soil and its preparation.—From tests made in various sections of the United States, it has been found that the tomato is adapted to a wide range of soils. In experiments carried on by Will W. Tracy, the ten largest yields of tomatoes were obtained from a great variety of soils, ranging from heavy clay loam to the lightest types. If it is possible to choose the soil, a deep, fertile, sandy loam will probably give the best results. On farms that are managed systematically, the soils are generally well maintained and in good condition to grow a satisfactory crop of tomatoes.

The tomato has an extremely large root system; therefore the soil should be plowed six inches or more deep. It should then be harrowed and cross-harrowed until the soil is fine and in good condition for transplanting the young plants.

Tomatoes, as well as other vegetables, should be grown on different soils each year. Tomatoes may successfully follow corn, cabbage, or almost any hoed crop or clover sod. They should not follow timothy sod, for great injury may result from cutworms and grubs.

Manures and fertilizers.—It is seldom wise to use fresh manure on tomatoes, for it causes the plants to produce an excessive amount of vines. However, it may be the only kind of manure available; if so, it is well to apply it the previous year. If well-rotted stable manure is to be had, it may be applied to the soil, just before the young tomatoes are planted, at the rate of from ten to fifteen tons per acre, depending on soil conditions.

For the average soil, if commercial fertilizer is used, one containing two per cent nitrogen, eight per cent phosphoric acid, and ten per cent potash is recommended. It should be applied either in the hills or broadca t

at the rate of about five hundred to one thousand pounds per acre, according to the richness of the soil. For soils poorer than the average, a 4-8-10 fertilizer applied at about the same rate is recommended. In some localities, fertilizer containing two per cent nitrogen, ten per cent phosphoric acid, and six per cent potash has produced good results. A good formula to use in mixing this type of fertilizer at home is one hundred and thirty pounds nitrate of soda, two hundred and fifty pounds high-grade tankage, or one hundred and fifty pounds dried blood, fourteen hundred and thirty pounds acid phosphate, and two hundred and fifty pounds sulfate of potash. In case the plants are small and seemingly backward, if part of the fertilizer is applied in the hills, it quickens growth and has a tendency to promote early maturity of the crop. If soil conditions are right, and the plants are thrifty, it makes but little difference whether the fertilizer is applied in the hills or broadcasted.

Varieties.—Many varieties, some of which are of questionable value as far as canning is concerned, are listed by the seedsmen. The following varieties are recommended: for the early crops, Bonny Best and Chalk's Early Jewel; for the midseason crop, Trucker's Favorite, Success, My Maryland, Greater Baltimore, and Globe; for the late crop, Ponderosa and Stone. The following small-fruited varieties are recommended for preserving: Yellow Plum, Red Plum, Yellow Pear, Red Pear, Peach, Yellow Cherry, Red Cherry, Red Currant, Yellow Currant, and Strawberry, or Husk—all of which, except the last, somewhat resemble the fruits of the same name. The fruit of the last-named variety is a small berry enclosed in a husk. Many seedsmen offer other sorts than those listed here, and some of them are results of work on the part of the seedsmen to develop something better than the original varieties. In tests carried on at one or two of the experiment stations, it has been found that seed of one variety bought from different seedsmen may vary so much that there will be a difference of two or three tons per acre in the yields. Seed bought from the firms that specialized in a certain variety produced the highest yields. Tests of the comparative yields of different varieties have been made, and, at the Illinois Experiment Station, Greater Baltimore was shown to be the heaviest yielding tomato.

Time and methods of planting.—Good plants may often be bought if there is a grower of tomato plants in the community. The price for these plants will vary from ten to twenty-five cents a dozen, or from a dollar and a half to eight or ten dollars per thousand, according to the character of the plants and the variety. When purchasing plants, the color and the shape should be taken into consideration. The stem of the plant and the top leaves should be tinged with purple, not a yellowish green, because a purplish tinge denotes that the plant has hardened and

is fit to be set in the garden or the field. The plants should be as broad as they are tall; spindling plants are not desirable.

It is not difficult to grow tomato plants, if one has hotbeds or a greenhouse. Suggestions about plant growing may be found in Reading-Course for the Farm, Vol. III, No. 58, page 111. The seed should be sown six or eight weeks before the plants are needed in the field. Special attention to watering and ventilation should be given; the amount will depend on the amount of sunlight and the outside temperature. Tomato plants require a high temperature for their best growth, but toward the end of the eight weeks, the sash should be raised a few inches during the daytime in order to harden the plants so that they will be in a condition

FIG. 4.—*Tomatoes growing at will, the general practice where grown for canning*

to withstand the outside temperature. This subject is discussed in further detail in Reading-Course for the Farm, Vol. IV, No. 90. If the plants are transplanted once or twice, they will have better-developed root-systems than if they are left in their original positions. If they are to be transplanted once, the seed should be started nine or ten weeks before the plants are needed in the field; if more than once, from ten days to two weeks should be added for each transplanting. Growing tomato plants in paper pots or veneer bands is one of the most successful methods. The plants may be started in a greenhouse, a hotbed, a cold frame, or a box in the house, and when they show the third leaf, they should be transplanted to four-inch paper pots or veneer bands. The plants should then be given careful attention as to ventilation and watering and should be properly hardened, or gradually brought under outdoor conditions.

They should be ready to set in the field from ten to twelve weeks from the time the seed is sown. The plants at that time should be about one foot tall and as broad as they are tall.

If early varieties are grown on very thin soils, the young plants should be set three feet apart in rows that are three feet apart; on heavier, richer soils, the distance between the rows should be increased to from three and one-half to four feet. The late varieties need more room, for the plants are larger than those of the early varieties; therefore they should be set four feet apart in rows four or five feet apart. If early tomatoes are grown by the stake method, the plants may be set as close as eighteen inches apart in rows that are three feet apart. The stake method is particularly adapted to the production of early tomatoes on a limited scale.

The rows should be marked out either with a homemade marker drawn by horse power or man power, or with stakes and line. In some cases the rows may be marked off by plowing furrows the proper distance apart. If the rows are to be cultivated crosswise as well as lengthwise, it will be necessary to mark off the field in both these directions so that the plants may be correctly placed.

The tomato plants may be set either by hand or by horse-power planters. If the former method is used, the plants may be set in the following ways: A small hole should be dug with a trowel, a spade, or some other implement, the plant should be placed in the hole, and the soil should be firmed rather tightly against the roots. Or if a furrow has been opened with a plow, all that is necessary is to place the plant in this furrow and to pack the soil about the roots. Plants grown in paper pots or veneer bands have to be set by hand, for the plants are taken to the field in these receptacles and the paper pots or the bands removed from around the roots, leaving them as undisturbed as possible. There are several good planters operated by horse power on the market. If tomatoes are to be planted on a large scale, one of these machines will be found of great value. They open the furrow, place the plant in position, water the soil around the roots of the plant, press the soil against the roots, and leave the surface of the soil smooth. With skilled labor, five or six acres can be planted in a day with one of these machines.

Cultivation.—Careful attention to cultivation throughout the season insures conservation of soil moisture. No weeds should be allowed to grow in the tomato patch, as they rob the plant of sunlight above the ground and of moisture and plant-food below the ground. Cultivation should be shallow, for the roots of the plants come rather close to the surface. A nine- or eleven-tooth cultivator, having small teeth, is preferred for this work, and if the plants are staked and grown close together, a

man-power cultivator is found useful. If it is not possible to cultivate close to the plant with a machine, the plants should be hoed by hand.

If the tomato plants are to be staked, a six-foot stake should be set securely on the north side of each plant. As the plant grows, it should be tied to this stake, at first three or four inches from the ground and then every foot above this mark. If the plant is to be pruned, as well as staked, all side shoots should be removed as they develop. The side shoots spring from the axils of the leaves, which are formed by the joining of the leaves to the stems of the plant. Early, clean, bright-colored fruit that can be easily harvested is the result of staking.

Insect pests and methods of control.—Cutworms frequently destroy tomato plants by cutting them off near the ground. If a small portion of poison bait made by the following recipe is placed near the plants, this pest may be controlled: bran, two quarts; paris green, one tablespoonful; molasses, one-half cupful; water, enough to wet the mixture thoroughly.

Flea beetles often injure newly set tomato plants to a considerable extent. Spraying with bordeaux mixture is the best method of control known for this insect.

The large green tomato-worm is sometimes a serious pest. The best way of controlling it is to pick the worms from the vines and kill them.

Diseases and their remedies.—The tomato is susceptible to a great many diseases. A rot that affects the blossom end of the fruit sometimes causes great loss because no complete remedy for it is known. Conservation of moisture in the soil is a partial remedy. This disease is especially prevalent during dry seasons and on dry sites.

Septoria, leaf spot, is a disease that often attacks tomato plants before they have been transplanted from the seed bed, and it is controlled with difficulty because it is carried over winter in the diseased leaves and stems that fall to the ground. When the plants are set out, all the leaves that touch the ground and others that show suspicious-looking dead spots should be pinched off. The plants, especially the underside of the leaves, should be sprayed then and afterwards at intervals of a week or ten days very thoroughly with bordeaux mixture 5-5-50. The plants should be staked and tied for greater convenience in spraying.

Harvesting.—For canning, tomatoes should be picked when fully ripe and showing good color. They should not be pulled from the vines, but the stems should be broken at the joint that nature has provided at a little distance below the calyx. Before placing the fruit in the basket, it is well to remove the calyx and stem by bending the stem slightly. It is necessary to handle the fruit very carefully; hence a rigid basket is the best to use for this work because it does not bend, and therefore crowd the tomatoes. They should be removed from the field quickly and used

as soon as possible. If they are to be sold, they must be graded to meet the requirements of the purchaser. After the crop has been fully harvested, the vines should be destroyed in order to prevent the spread of disease.

Yields.—Yields vary greatly. One hundred bushels per acre is an average yield in several states, though this is exceedingly small. In some sections of this State, tomatoes yield from two to five hundred bushels, or from six to fifteen tons, per acre, and under intensive methods of culture as high as from eight hundred to a thousand bushels, or twenty or more tons, per acre. For canning, the price paid for tomatoes is from seven to twelve dollars per ton. A fair profit may be realized if nine or ten dollars per ton is paid, providing labor is reasonable in price, the haul to market is not too great, and other conditions are favorable. The cost of growing an acre of tomatoes varies from fifty to sixty-five dollars. There is, therefore, from twenty-five to forty dollars profit per acre in this crop.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

Entered as second-class matter at the post office at Ithaca, New York

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RAISING VEGETABLES FOR CANNING

DISCUSSION PAPER

By means of the discussion papers we have an opportunity to become acquainted. We shall take it as an indication on your part that you are interested if you answer the questions and return them to us. The staff of the Department of Home Economics is ready to assist in your study of scientific home-making. We want your assistance as well. Ask questions, offer suggestions, let us have the benefit of your experience. You thus become a vital part of the Department of Home Economics in its effort for scientific housekeeping.

Will you please send your opinions on the following points to the Supervisor of the Cornell Reading-Course for the Farm Home?

1. What differences in the beans, the beets, the sweet corn, the peas, the spinach, and the tomatoes that you have grown from year to year have you noticed that can be directly traced to sources of seed?

2. In growing beans, beets, sweet corn, peas, spinach, and tomatoes, have you found that growth or yields have been influenced by the differences in soil? Explain.

3. State your method of preparing soil for any one of these crops?

4. Would you consider rotations of crops a valuable practice in growing these vegetables? Why?

5. Under what conditions have you obtained large yields of beans, beets, sweet corn, peas, spinach, or tomatoes?

6. Are there problems in the growing of the vegetables discussed in this lesson that you would like to have solved? Explain.

Name..

Address...

Date..

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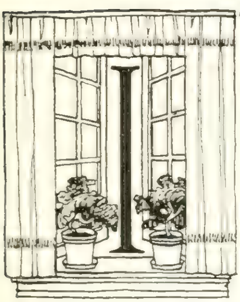
VOL. IV. No. 85 | APRIL 1, 1915 | FARMHOUSE SERIES No. 7

THE ARRANGEMENT OF HOUSEHOLD FURNISHINGS

HELEN BINKERD YOUNG



IT IS the common experience of mankind that the human race cannot live much above its environment. The grandeur of purpose of some rare souls has lifted them above the touch of mere earthly trappings, but, for the most part, men are molded by the thoughts and things that are about them. Slowly and silently an exchange of influence takes place between the individual and his environment. Each gradually absorbs the most conspicuous qualities of the other. Stupid and commonplace surroundings at length breed a dull and unimaginative outlook on life and render the mind insensitive to new ideas and impressions.

Still more baneful are such influences as untidy yards and buildings, which are in the first place the result and later the cause of careless habits of work and of thought; on the other hand, orderly, attractive homesteads not only express but in their turn create orderly habits of thought and of work. In the last analysis, disorder and ugliness are destructive agencies, while order and comeliness are constructive agencies in a person's environment.

A sound home environment is, therefore, nothing more nor less than a set of outward conditions so adjusted as to encourage the richest living.

While the amount of human energy that is lost through working against unfavorable conditions is not measurable, the evidence of all nature, as well as the intelligence of mankind, points in the direction of harmony or cooperation of forces as favoring healthy growth. This elemental fact justifies the spending of serious thought on the subject of home environment. If dwelling places can be made, first of all, sound for their use, and second, comely to view, both the practical and the æsthetic needs of the home will be recognized.

The ability to create frictionless home surroundings depends chiefly on the cultivation of two qualities, a sense of arrangement and a sense of selection.

By arrangement is meant the systematic placing of objects within a given space, as the placing of rugs on a floor, pictures on a wall, furniture in a room, shrubs, lawn, and paths in a yard, or even such lesser things as dishes on a dinner table.

By selection is meant the choosing of materials or objects that will suitably fit into the proposed plan, as the selection of rugs, wall papers, furniture, pictures, dishes, or plants.

THE MEANING OF A FURNISHING SCHEME

In order that success may attend the housewife's efforts at creating a sound environment, a study of arrangement should precede any attempt at furnishing, or even the selection of new articles. To be sure, many of the practical problems of the home arise quite the other way round, that is, certain articles have been inherited or have been acquired through a number of years, and the main problem is to find a place for them. Such a method is, however, a back-handed approach to the problem of furnishing, and has been the original cause of the usual conglomerate effects; for if furnishings are bought under pressure of immediate need and without any relation to a comprehensive scheme of arrangement, the rooms where they are used will naturally lack unity of idea and therefore of effect. Although it will take more time, it is, in the end, far more satisfactory to work out a definite plan for the completed room, arranged and equipped according to its use, and, as time and means permit, to assemble the various objects that are needed. Whether old or new furnishings are to be used, the most pleasing and livable interior will result from such a procedure. Little by little the plan can then be developed until the rooms are completed. Such a result is sure to be more rational, more simple, and more effective than if an attempt is made to combine an unstudied assortment of objects.

A STUDY OF ARRANGEMENT

When a number of useful objects are to be disposed in a given space, it is necessary to consider first the practical and then the decorative aspect of the arrangement. To use a homely example, the contents of a jelly closet should, for convenience sake, be arranged on shelves in neat, orderly rows, with like kinds of fruit grouped together. While the use of many kinds of jars is entirely feasible, it is evident that if only those of a uniform size and shape are used, the display will be more shipshape and impressive. Indeed so friendly are the elements of beauty and of convenience that

ordinarily if a number of articles are arranged in the most attractive way, they will be found to be arranged at the same time in the most convenient way. Thus the neatest looking arrangement of a closetful of clothes results from hanging garments on a row of hangers suspended from a single rod. This is, at the same time, the most sensible arrangement, since it not only keeps the clothes in shape but displays the contents of the closet without search.

Although the fruit closet and the clothespress represent the idea of arrangement in condensed form, they illustrate the fact that the basis of both convenient and effective arrangement is system, order, classification, and common sense, and that the arrangement in any case will depend on the needs of the problem and the space at one's disposal.

If such familiar ideas of arrangement are applied to the larger problem of furnishing, a similar solution is possible. The exact use of the room is,

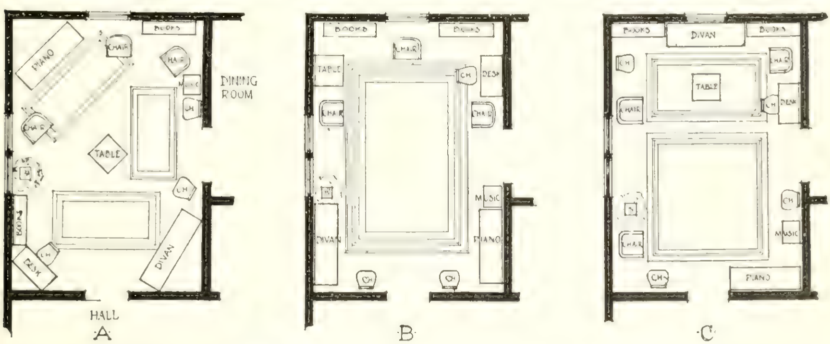


FIG. 5.—*Three furnishing arrangements worked out on plan*

or should be, definitely settled in order that the furnishings may be so selected and arranged as to fit it for its use. The spaces in which the furnishings may be disposed are determined by the size of the room, the location and the size of the various windows and doors, and the size and the shape of the resulting wall spaces. In brief, the problem is to arrange the necessary furniture within a given space, in a way that will be reasonable for use and pleasant to see.

The plan of a living room fourteen feet wide and twenty feet long is shown in figure 5. This room has four openings, two windows (one of them double) and two doors; each of these openings is located in the middle of a wall, thus leaving large equal spaces to right and to left. As a result, each wall of the room is symmetrical and is therefore balanced and dignified in appearance. Diagrams A, B, and C represent three possible arrangements of the same furnishings, with the exception of rugs. The instant impression given by diagram A is one of confusion and unrest; by diagrams B and C, one of order and repose.

In A the eye glances restlessly from one object to another. Diagrams B and C are instantly pictorial because they are in keeping with the principles of good arrangement. They are characterized by large open spaces and by furniture placed around the walls. The eye is at rest in either of these arrangements.

In diagram A the objects are scattered about the room, creating an impression of too many things and too little free space. The placing of the furniture is irregular and unexpected, so that persons are likely to bump into things when moving about the room. The larger pieces are placed diagonally across the corners. Each time this is done, a triangle of space is wasted behind the object, and two corners are awkwardly projected into the room. Consequently each object so placed not only appears to, but actually does, occupy more room than if placed against the wall. Furthermore, the space behind the piece becomes a dust hole, so that the furniture must be moved for cleaning. A diagonal arrangement cannot therefore be considered a sensible one except perhaps for chairs, which can be moved easily and which are often of a suitable shape to fit into the corners. Nor is a diagonal arrangement of furniture an effective one, for the main lines set at defiance the outlines of the room, which are rectangular. Consequently the objects seem to be located without reference to the space that contains them. In diagram A small rugs are used in place of large ones, thus breaking up the central space and giving a scrappy appearance to the floor. Moreover, for a room used by a number of persons small rugs are likely to be kicked up at the corners and to slip as they are stepped on. The style of rug used, whether it be a rag rug or an oriental one, does not in the least alter the manner of arrangement.

In diagram B the furniture is arranged parallel with the walls, thus following the outline of the room. The pieces that are related in use are grouped — desk, books, library table, and comfortable chairs occupying one end of the room, and piano, music cabinet, and more seats, the other end. The room thus has two centers of a rather definite nature and use; one center is quiet in character; the other is sociable. A large central rug laid parallel with the walls of the room unites the two groups and at the same time defines the open space that is free for passage. With such an arrangement, persons moving about the room are in no danger of running into oddly placed objects. This arrangement is both more reasonable and more restful than arrangement A.

Diagram C is an alternate arrangement for carrying out the two-center idea already explained. Here the reading center has been emphasized by placing the table on the longitudinal axis of the room and by using a separate rug for each group. The location of the divan and the piano

along the width rather than the length of the room, tends to make the room look wider and shorter than in B. This suggestion is an important one to remember when furnishing a narrow room; objects placed across the ends seem to widen and shorten the space, while objects placed along the sides tend to increase the already great length and to decrease the already narrow width. The arrangement shown in C is both livable and restful.

THE ESSENTIALS OF ARRANGEMENT

From the foregoing analysis it is evident that good arrangement results from observing two general principles: first, the arrangement of objects should follow, repeat, or fit the structural outlines of the space used; second, objects should not be scattered over the space, but should be disposed in groups or masses in order that large open spaces may be left to set off the arrangement.

The diagrams shown in figure 6 illustrate the first essential of good arrangement. The long side of a room is shown with draperies at window and door, and with couch and pictures between.

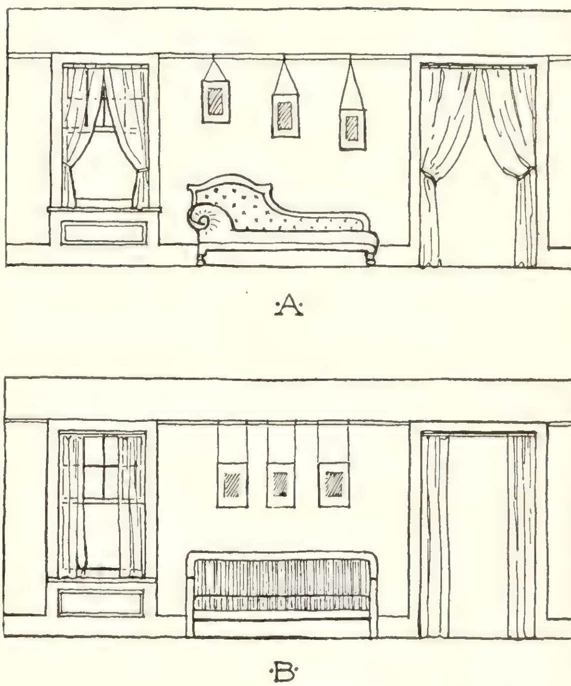


FIG. 6.—*Arrangements of furnishings along an interior wall. Diagram A illustrates poor arrangement; diagram B good arrangement*

In arrangement A there is a continual use of diagonal lines in the disposition of the furnishings; the curtains are draped back, the pictures are hung in steps, and the couch has an irregular sloping back. As a result the general impression of the arrangement is spotty and fancy.

In B the furnishings are all arranged in straight lines, thereby creating a simpler, more restful, and more dignified effect than the one shown in A. In B the window and door curtains hang in straight folds, following the structural shape of the openings; a couch of simple, rectangular form

is placed centrally on the large wall space between window and door; above it are grouped three pictures of equal size, hung in a straight row from straight wires. The tops of window and door are on the same level, and so may be joined by a molding.

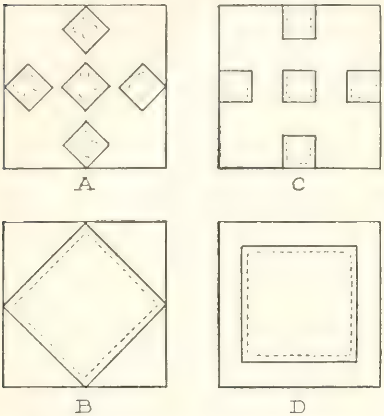


Fig. 7.—*Good and poor arrangements of mats on a table*

Other illustrations of the foregoing principle are shown in figures 7 and 8. The arrangement of square mats in diagrams A and B of figure 7 is illogical and poor, because it does not follow, repeat, or fit the structural outlines of the table top. By the same analysis the arrangements shown in diagrams C and D are good. By similar reasoning it is evident that the arrangement of pictures on a page, illustrated in figure 8, is poor in diagrams A and B and good in diagrams C and D. Both reason and visual repose are expressed in the good arrangements of figures 7 and 8.

The diagrams in figure 9 illustrate the second essential of good arrangement. In diagram A three windows are placed at wide intervals along a wall, thereby breaking both the lighting and the wall area into several insignificant parts. In diagram B the windows are grouped. This arrangement is not only more interesting than the one shown in A, but it is more sensible, since it leaves large wall spaces on either hand for furniture. Furthermore, a single flood of light coming through a group of windows is more effective than three separate shafts of light that so cross and recross each other that it is almost impossible to place a piece of furniture or to work out a color scheme with any certainty of effect. Therefore both sense and beauty favor arrangment B.

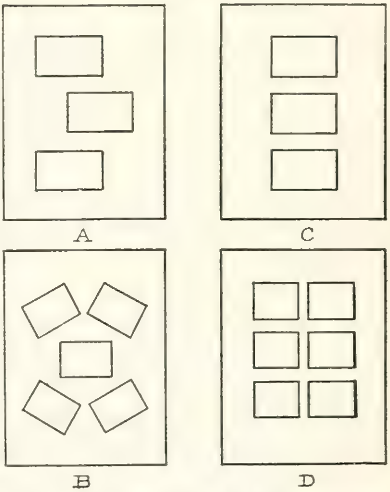


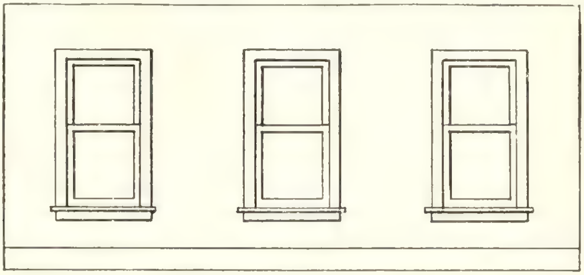
Fig. 8.—*Scattered and orderly arrangements of pictures on a card*

These two essential ideas of arrangement are general, and hence may be applied to any problem of arrangement whether large or small. For instance, thus tested, the old nursery

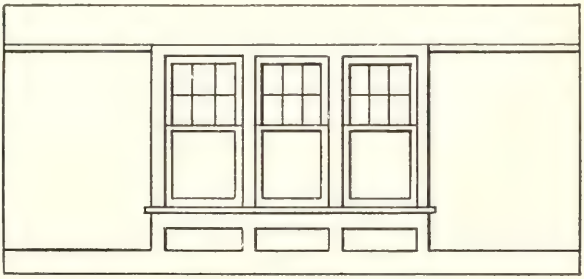
method of planting shrubs and trees was a violation of good arrangement, since it merely scattered them here and there over an open lawn.

BACKGROUND AND ORNAMENT

Any tendency to cover up plain space by sprawling objects over it should be checked at the start, for it spoils rather than creates an effective arrangement. Vines, ribbons, and flowers strewn at random over a dinner table with the idea of making it appear festive, defeat their purpose and end in nothing more attractive than fussiness. Table decorations condensed into definitely placed spots or central masses are much more effective, since each is set off by the plain cloth that surrounds it.



A



B

FIG. 9.—*Separate and grouped window arrangement*

It should be remembered that with any arrangement of objects the idea is not to cover all the space but rather to preserve as much of it as is possible and yet comfortably include all the necessary features. Plain space, or background, is the signal that draws attention to an object or an arrangement. The tree that commands attention as it stands alone on a hill, would not be noticed in a forest; the group of persons that arouse interest when met in the open road, is of small consequence when lost in the crowd. Where there is no background, there is no picture.

Ordinarily it is not the purpose of home decoration to display any one object, but rather to use it as a unit in the general scheme. If, however, there be some object so rare or so lovely as to be worthy of especial notice, it should be set apart from its fellows with plenty of space around it.

In acquiring a sense of arrangement one must keep constantly in mind the purpose for which objects or materials are chosen and used. They must be true to the function for which they stand. Qualities that would be unbearable in a picture can be forgiven in a chair, for, if a chair is comfortable and soundly built, it must be granted a grudging respect even though it be cursed with poor ornament. But a weak or an inane picture has no excuse for being, since its only value is an æsthetic one, and if it fails in this, its very presence gives the lie to its apparent purpose.

Unless objects that pretend to be artistic are of a superior quality, they are of no use whatever; the space they leave unoccupied is more valuable than their presence. Better an excess of empty space than one article too many, for space is expressive of dignity and repose and acts healingly on the tired mind and body. It has been said that the sculptor is thrilled at the sight of an uncut block of marble because of the enormous possibilities it suggests to his imagination; likewise that the artist is stimulated to great dreams before a stretch of empty canvas. Even so do the free spaces of an uncrowded home react on the minds of the occupants.

THE VALUE OF A PLANNED ARRANGEMENT FOR FURNISHING

The diagrams in figure 5 are suggestive of the way in which the arrangement of other rooms may be worked out. Not only the living room but also the study, the office, the dining room, the kitchen, and the bedrooms may be completely planned out with pencil and paper.

The advantages of furnishing or refurnishing according to a definite arrangement are several:

First, the plan is fixed before it is carried out. In this way every decision can be wisely balanced without the pressure of hurry.

Second, a plan makes for economy, for it reduces the usual mistakes in purchasing to a minimum, and puts a check on needless and impulsive buying. At the same time it finds a place for and uses to advantage present belongings.

Third, it eliminates trash and bric-a-brac. No one would seriously include in a furnishing scheme the mass of trifling stuff that is allowed to accumulate in the home.

Fourth, it simplifies the problem of selecting new articles, for the nature and the use of the various things are defined by the plan.

Fifth, it secures a coherent result.

Last and best, the planning of the arrangement gives play to the imagination. It becomes, for the time being, a game. It is so easy, so inexpensive, and so delightful after a hard day's work, to sit down in an easy chair and give vent to a dream. Without waste, disorder, or a

penny's worth of expense, one can mentally sweep a room bare of its furnishings and work out a new furnishing scheme as one would like to have it. The next day that scheme may be discarded and replaced by a different one. The third day a fresh idea may arrive, until the one desired result is finally crystallized, after many moods and thoughts have been brought to bear on the problem, and impressions have taken shape. Then it is time to get pencil and paper so that all the data on walls, floors, curtains, chairs, and the like, may be grouped together and used as reference material.

The room or rooms in question should then be accurately measured and drawn out on paper at a scale of perhaps one-quarter of an inch to the foot. Every window, door, jog, or built-in feature should be exactly located on the drawing, and its size marked. The various pieces of furniture to be reused should be measured, and their sizes recorded. A person thus has in graphic form the actual sizes and the structural conditions of the space and the furniture at his disposal.

SOME GENERAL SUGGESTIONS

It is evident that the task of selecting new furnishings becomes simple in proportion as the plan of arrangement becomes definite. In order to experiment intelligently with the problem of final arrangement, it is necessary to canvass the details of the whole situation. The selection of new things then becomes a matter of choosing such objects as will fit a definite place, a definite purpose, and a more or less definite color scheme.

Nothing so helps a tradesman to show a customer the right goods, as a specific description of the article desired. If a customer asks to be shown plain or two-toned wall papers in warm gray, tan, or brown, he immediately classifies his request in such a way that the salesman can without waste of time show whatever goods he has of the sort described. Then, too, the purchaser not only sees what he asks for, but is spared the bewilderment that usually results from being shown an array of undesirable showy papers.

A salesman has no way of knowing what is wanted if the customer himself is vague in his request. Consequently the clerk is forced to show his whole stock and to use whatever powers of suasion he has to make some sort of a sale. Frequently the maze of material that is shown confuses rather than clarifies the mind of the customer, so that he is easily persuaded to buy something, which, on reflection, his common sense or taste would declare unfit. Two or more trips to the store are usually better than one, unless one's taste and decision have proved especially reliable. Several shopping excursions are hardly more wasteful of time and effort than the energy that is lost through disliking or regretting or even enduring for years a misfit purchase.

No one should count as lost the time that is consumed in a personal cultivation of taste. There is in every human being, and especially in every woman, an innate yearning to express herself in the things around her. If she can learn to translate human qualities into material ones, that is, if she can learn to see the relation between orderliness of arrangement and tranquility of soul, between confusion and nervousness, between harmony of color and harmony of mind, between honesty of form and directness of thought,— then she will have realized the essential meaning of art in daily life and will be able to mold the home surroundings, not according to outward rules and conventions, but according to inward needs.

THE CORNELL READING-COURSE FOR THE FARM HOME

This course was instituted so that the problems of the farm home could be studied in the same scientific way as are those of the farm. The lessons are on such household subjects as relate to food, shelter, and clothing, and are accompanied by discussion papers. The discussion papers contain questions that bring out the point of view of the practical housekeeper. As a result there has been a large personal correspondence with the women of the State, who are at liberty to ask questions at any time relating to their home problems. The Reading-Course for the Farm Home is free to residents of New York State. A lesson is issued each month. For further information address the Department of Home Economics, College of Agriculture, Ithaca, New York.

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15 Principles of jelly-making
17 The preservation of food in the home.— Part I
19 The preservation of food in the home.— Part II
21 The preservation of food in the home.— Part III
23 Rules for cleaning
25 Saving strength
27 Choice and care of utensils
29 Cost of food
31 Household bacteriology
33 Vegetable-gardening
35 The flower garden
37 Home economics at the New York State College of Agriculture
39 The farmhouse
41 Rules for planning the family dietary
43 The box luncheon
45 Hints on choosing textiles
47 A canning business for the farm home
49 Household insects and methods of control
51 A story of certain table furnishings
53 The Christmas festival
55 Rice and rice cookery
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59 Sewage disposal for country homes
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63 The young woman on the farm
65 Farmhouse amusements for girls and boys
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71 Canning clubs in New York State.— Part III. Canning equipment
73 Making cake.— Part I
75 Making cake.— Part II
77 Songs that live

The preceding list is correct to April 1, 1915. The demand may at any time exhaust the supply of particular numbers. Requests will be filled as long as the supply lasts.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

Entered as second-class matter at the post office at Ithaca, New York

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THE ARRANGEMENT OF HOUSEHOLD FURNISHINGS

DISCUSSION PAPER

By means of the discussion papers we have an opportunity to become acquainted. We shall take it as an indication on your part that you are interested if you answer the questions and return them to us. The staff of the Department of Home Economics is ready to assist in your study of scientific home-making. We want your assistance as well. Ask questions, offer suggestions, let us have the benefit of your experience. You thus become a vital part of the Department of Home Economics in its effort for scientific housekeeping.

Will you please send your opinions on the following points to the Supervisors of the Cornell Reading-Course for the Farm Home?

1. What points do you consider important in the arrangement of a dining room?

2. What features have troubled you most about the arrangement of your kitchen?

3. What points do you consider important in the arrangement of a bedroom?

4. Do you notice and enjoy the pictures on your walls, or do you regard them as space fillers?

5. What three features about your home are most restful to you?

Name..

Address..

Date..

The Cornell Reading Courses

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VOL. IV. No. 87 | MAY 1, 1915 | FARMHOUSE SERIES No. 8

THE DECORATIVE USE OF FLOWERS

ANNETTE J. WARNER

IN THE reading books used in school two or three generations ago, there was a poem by Mary Howitt, entitled *The Use of Flowers* in which was advanced the startling proposition that

> God might have made the earth bring forth
> Enough for great and small,
> The oak tree and the cedar tree
> Without a flower at all.

The world would be empty indeed if from mountain and plain, garden and greenery, literature and song, art, language, and the soul of man, had been absent the potent influence of the gentle race of flowers. Gems and birds, dawns and sunsets, earth and ocean, would have given manifestations of nature's superabundant wealth, but not with that intimate sympathy with which the flowers, nestling deep into the heart of man, have interpreted the wonderful color possibilities in a ray of light, and expressed nature in her most friendly mood. A few grasses, the warm earth after rain, the salt tonic of the sea, might have suggested a secret garden beyond sight and sound, where the air was imbued with a new vitality; but without the flowers where would have been found the key to this perfumed paradise or the vocabulary wherewith to name its treasures?

With no consideration of the part that structure and odor of flowers play in the perpetuation of plants, or of their value as reservoirs of honey or as storehouses of medicine, this lesson deals with only their æsthetic service, " To minister delight to man, to beautify the earth."

Before men were bidden nearly two thousand years ago to " consider the lilies," flowers were used in decorative design and religious ceremonial, probably for their symbolism rather than for real delight in their beauty. The poets of Japan, however, celebrated the beauties of flower and tree

in verse and song as early as the seventh century. But, though Chaucer and Shakespeare were close observers of nature, it was not until the time of Wordsworth and Ruskin that there was among western nations the human response to nature's appeal that is known to-day. Now there is no important function in the social world,

A wedding or a funeral,
A mourning or a festival,

in which so-called floral decorations do not play a part. There is much yet to learn from the canons of good taste as to the appropriateness of a mere lavish display, especially of exotics and forced hothouse flowers. The Japanese would be as ready to wear summer clothes in winter as to use flowers that are out of season for decorative purposes.

The term flowers, as used in the title of this lesson, refers not only to blossoms but to leaves, berries, seed packs, and any other form of plant life that has decorative possibilities.

An arrangement of flowers may be a work of art in which every essential of design in form and color may be exemplified. In such creative work there are four steps:

1. Gathering the plant materials
2. Selection of the receptacle that is to contain them
3. Effective placing of the arrangement
4. Manner of arranging the flowers in the receptacle

GATHERING THE PLANT MATERIALS

The three general sources from which to obtain plant materials are the greenhouse, the garden, and the fields and woods.

The greenhouse.— The greenhouse is the most specialized and expensive source for plant material. While on certain occasions and at certain times of the year it is necessary to use hothouse plants, the greenhouse cannot be considered a general source of supply for everyday use. Hothouse flowers bear about the same relation to garden and wild plant materials as fresh tomatoes in winter bear to the bulk of the family diet. For this reason the hothouse product will not be further considered in this lesson.

The garden.— By the garden is meant any place where plants are invited to grow, in fence corners, beside walks, against buildings, around doorways, in beds or borders.

It is not necessary to have a large plot cultivated as a garden, but from frost to frost let no one who has even a bit of land connected with his home be without a succession of bloom, which may be gathered to grace the

table, enliven the living room, give welcome to the guest, or bear a message of sympathy or congratulation to other households. A careful study of any good seed catalogue will supply a list suited to the needs of all homes. Even so limited a variety as small beds of lilies of the valley, pansies, and nasturtiums, with a row of sweet peas, should furnish a succession of flowers throughout the season. All of these flowers are grateful for being picked, are delicate in odor, have great variety in color and form, and would add to every meal a touch that would lift it from the plane of mere physical necessity to one where the spirit also is refreshed. In some

FIG. 10.—*It is a pity to despoil the roadsides of flowers, sprays of berries, and other growths*

flower-loving cities, such as Washington, Baltimore, Indianapolis, and the cities of California, the markets afford an opportunity to buy flowers as well as foods.

> "If I had two loaves of bread,"
> Mohammed said,
> "I would sell one that I might buy
> Sweet hyacinths to satisfy
> My hungry soul."

By planting one new shrub or one or two perennials each year a person would, almost before he is aware of it, have a group of garden materials that would never be without blossoms. Such a planting would furnish

a variety of color schemes from month to month, which would make a decorative feature on the outside of the house, and which would be ready to add its quota to the special occasion in home, church, or town. There are plants, such as hollyhocks, foxglove, and some other border plants and shrubs, that should not be asked to spare their flowers for any ordinary occasion, but when placed within view of the windows such flowers help to complete the adornment of the room.

The school may also have its garden. There is a wonderful sense of proprietorship in the flowers brought up by hand in the school yard. Here again formal beds and garden plots are not desirable. Flowering plants are much more decorative when planted near fences and steps, or beside walks, walls, and buildings. If seed catalogues were carefully studied in the winter, and if each child or a group of children were responsible for flowers certain weeks in spring and fall, what joyous lessons in gardening, in color, and in design might result! Hardy perennials that are early or late bloomers would be the better choices, of course; otherwise arrangement must be made for the care of the plants during the long vacation. It would be better to have no plants at all than for the children to grow weary and leave a group of famished flowers to testify to a passing affection.

Nowhere are flowers more appropriate than in the church. Here the scale or the size of the flower arrangement is an important consideration. The charming little nosegay suitable at home is entirely lost in this larger place. Only large blossoms or sprays are adapted to church decoration; therefore, when the garden is planned it should include not only small, intimate flowers, but some of a bolder nature.

The fields and woods.—The school, with its many eager messengers, can easily depend for its decorative material on field, forest, mountain, and meadow. The supply is boundless, the season a complete circle. Experience teaches, however, that some flowers, which are exquisite in their native haunts, do not lend themselves happily to the conventional environment of the interior of buildings. Children should be taught what flowers to gather and how to gather those.

Any one who has an extended acquaintance with children or with schools, is familiar with the bunches of flowers gathered, short-stemmed and leafless, by eager little perspiring hands and brought as offerings of devotion to the teacher, who crowds them all — violets and buttercups, sturdy growths and dainty growths — into one receptacle, where color and form fight with each other and not even the fittest survive. One teacher takes her children on a collecting expedition, but instead of handfuls of flowers they bring home mental pictures. After studying the flowers carefully in the places where they grow, they shut their eyes and describe

them. If they have an incomplete picture, they open their eyes and study the plants again. Such pictures are indelible and may be referred to at will through life. A single flower or sometimes a bunch of flowers may be taken for the schoolroom, but thoughtless waste of a harvest that one has neither planted nor watered should be discouraged. Such verses as the following by Juliana Horatia Ewing may well be committed to memory:

Little kings and queens of the May,
Listen to me!
If you want to be
Every one of you very good,
In that beautiful, beautiful, beautiful wood,
Whatever you pluck
Leave some for good luck.

Picked from the stalk or pulled up from the root,
From overhead or from under foot,
Water wonders of pond or brook;
Wherever you look and whatever you find,
Leave something behind.
Some for the Naiads, some for the Dryads,
And a bit for the Nixies and Pixies.

O little sisters and little brothers,
Think for others and care for others!
And of all your little fingers find
Leave something behind!

Children are not the only offenders. The ruthless devastation of some of the choicest plants by grown persons is even less excusable. The dainty arbutus, which ten years ago used to steal out from under the snowdrifts to lay a carpet for the coming spring, is nearly extinct now in many localities. There are street venders who make it a business to go out to the country to capture these babes of the wood, tie a cord tightly around their necks, surround them with galax, and offer them for public sale in the city streets. The few native Nantucketers who know it could not be induced to tell the cherished secret of the hiding place of the heather. They know too well the greed of the summer visitor, which would not leave a single plant to tell the romantic tale of these little wanderers from over the sea who have found a few rare places in this country where they feel at home. The finger of shame should be pointed at any one who brings home from his woodland walk an armful of orchids or trilliums or cardinal flowers. Such vandalism defeats its own end, for nature has indicated, by the rarity with which she has placed them, that one, or at most three, are enough for one person. The distinction of the orchid is in its form.

One plant of the *Cypripedium acaule* is better than many to show the forceful curve of the stem rising from the ground with its one rare blossom. No line of this unusual plant, from the root leaves to the toe of the moccasin with its fluttering ribbon ties, should be lost.

It is a pity to despoil the roadsides of flowers, sprays of berries, and other growths that have been arranged so picturesquely by the landscape gardener, Nature. By going a bit out of the way into wood or pasture one can usually get any quantity of the same flower and thus leave unmolested those by the wayside to gladden the eyes of all later passers-by.

The amateur botanist has doubtless been responsible for the disappearance of some rare plants. It used to be "accounted for righteousness" in the schools to capture as many specimens as possible, press, mount, label, and file them for future reference. One enthusiastic high school teacher was accustomed to require each member of her class to secure seventy-five specimens. A better test is suggested by Emerson:

> Hast thou named all the birds without a gun,
> Loved the wood rose, and left it on its stalk?

There is one hopeful element in this greedy appropriation of the wild flowers. It indicates a growing appreciation of nature, which may lead in time to the perpetuation of some of the fast vanishing species, and the growing of them in their native haunts where the right conditions of soil, water, light, and heat can best be obtained. There are waste lands suitable for such plants, which might be made to yield a good income, and a new industry, the intelligent propagation of wild flowers for city markets, might be established.

There are many flowers, such as daisies and buttercups, asters and goldenrod, Queen Anne's lace and black-eyed susans, that may be picked in unlimited quantities. If pulled up by the roots, the approbation of the farmer, who regards them as pests, would be secured. Most of these flowers are attractive, too, in large masses, and nature will see to it that these little Ishmaelites of the fields do not perish from the earth.

The gentian is not "the year's last child," and resources for decorative motives for home, school, and church, are not exhausted when the snow comes. One drawing teacher never begins a winter without some sprightly little sedges in one particular vase, some cotton grass in another, some branches of the bayberry, and a mass of russet oak leaves, which are quite as appealing in color and form as in their green youth. The scarlet berries of the black alder, or *Ilex verticillata*, the bittersweet, the gray-green boats of the milkweed with their silk-winged crew just peeping out, and many berries and seed packs, are as effective for decoration as are flowers.

Fields and woods are replete with decorative material of a sufficiently large and generous growth to be suitable for the church. Foliage is often more effective than flowers. The evergreens are all good. Small spruces and cedars, potted from the pastures and standing straight as Christmas candles and symmetrical as bay trees, are excellent decoration. Masses of oak leaves, laurel, or evergreen are in general more appropriate than palms for the northern latitude. Nor need one be confined to green in the use of foliage. One of the most effective decorations in a gray and ivory, red-carpeted, colonial church, was produced by the use of sprays of grapevine arranged in jardinieres and trailed along the choir rail so that the soft whitish undersides of the leaves appeared like so many blossoms. The new growth of the oak and the maple on burnt-over or pasture lands is as exquisite in color as are flowers. One sumac bush, with its vigorous leaves and upright cones of red standing before the pulpit, should inspire shepherd and flock alike to lift up their hearts in thanksgiving to Him who made all things beautiful in their season.

There are always organizations, the Christian Endeavor, the Priscilla, the Girls' Friendly, and the women's societies, that would undertake to make the church beautiful every Sunday if only there could be found a leader to organize the work. In one country town a women's club arranged to furnish the flowers from both garden and field according to the list given at the end of this lesson.

If every one but realized the decorative resources supplied by the native trees and shrubs, which grow all about, school, church, or grange hall would never be disfigured by silly festoons of brilliantly colored paper and bunting — an artificial attempt at decoration excusable only in cities where natural materials are not available.

In order that the flowers may keep, as well as to protect the plants, flowers should be cut, not picked nor "pulled," preferably in the morning or the evening. When cut they should be plunged as soon as possible into deep water and allowed to stand in a cool room or a cellar for two or three hours before they are arranged. If some time elapses before they are arranged, it is better to snip the ends of the stems again. They should be placed so that the blossoms are supported, especially if they are fragile; often long-stemmed blossoms will keep much longer if "rested" in this way during the night.

Flowers stay fresh much longer if the temperature in which they are grown can be maintained. Sometimes such flowers as heliotrope and dahlias will keep much longer if the stems are thrust into boiling water or into a direct flame for a moment, and immediately after plunged into cold water. Green branches cut in winter should be placed in ice water.

a b c d e f g

FIG. 11.— *For many flowers nothing is better than plain glass bowls or vases, which may be obtained in a great variety of shapes at a department store.* a, *Water-color painting cup.* b, *Olive bottle.* c, *Oil bottle.* d, *Square glass dish.* e, *Straw-covered bottle.* f, *Glass flower holder.* g, *Glassware*

Flowers keep fresh longer if the leaves below the water are removed, for the decaying vegetable matter poisons the water. If glass vases are used, it would not, of course, be desirable to strip the stems of the foliage, but the water should be changed very frequently. The ends of the stems should not rest on the bottom of the container. With a large surface of water exposed to the air flowers will remain fresh longer than when the surface is small and confined.

SELECTION OF THE VASE OR THE RECEPTACLE

Simplicity and fitness are guide words to use in the selection of a receptacle for any decorative arrangement of flowers, and every home maker, teacher, and church society should have a large variety. Celia Thaxter,

FIG. 12.— *A collection of pottery in good neutral coloring obtainable in the housekeepers' section of a department store*

FIG. 13.— *Reasonably priced vases of good shape and texture in neutral tones of various colors*

who spent most of her summers in a garden on the island of Appledore, had over a hundred containers of all shapes and sizes, in low neutral colors. This does not necessarily entail a large expense. Only one of those used in the illustrations given herewith cost more than a dollar, and some of them were obtained without money and without price, being the containers for olives, mustard, oil, ginger, or other commodities. The purveyors of some brands of goods believe that a well-designed receptacle will aid in the sale of their products. These are much better than the vases, ugly in line, unwieldy in shape, aggressive in color, overloaded with decoration, that are manufactured to sell to the innocent and the unwary for Christmas presents. The color or the decoration on the receptacle should be in accord with that which it contains, echoing its

a b c d e f g h

FIG. 14.— *Good flower containers.* a, *Confectionery container.* b, *Mustard jar.* d, *Section of bamboo.* f, *Blacking bottle.* h, *Ginger jar.* c, e, and g, *Odd shapes picked up in travel*

color, line, or shape, but never vying with these. The province of the receptacle is to serve; its highest use is to supplement, to enhance, the beauty of the composition, as does the accompanist the song, as does the frame the picture, as does the gown the woman.

A suggestion for the color of receptacles may be taken from the natural environment of the flowers. Swamp orchids spring from gray-green beds of moss, delicately colored flowers of the springtime from the brown leaves of the previous autumn, and later summer flowers from the soft green tints of the sod land.

For many flowers nothing is better than plain glass bowls or vases, which may be obtained in a variety of shapes at a good department store (Fig. 11). The stems showing through the glass add an effect of color sure to harmonize with the whole. Sweet peas are never more effective than in a straight glass tumbler; pansies need a low bowl, and the lily a high flaring vase. Each arrangement calls for its special shape, and the true lover of flowers will keep an eye open for these, not scorning humble sources (Figs. 12 and 14).

EFFECTIVE PLACING OF THE ARRANGEMENT

The placing of an arrangement of flowers often determines its form; therefore the position it is to occupy should be considered from the first. The observer's point of view should influence the arrangement. Some plants look their best in a jar placed on the floor. Pond lilies never look so well as when floating in a shallow dish on a taboret or a stand that is lower than an ordinary table. Some plants or bouquets are most attractive when placed on a window sill and silhouetted against the light. White lilies or golden glow light up a dark corner effectively. Drooping branches or vines arrange themselves naturally when placed on a mantelpiece (Fig. 15) or in baskets or other receptacles hung against the wall. If the walls of the room were thought of as the background for flowers and pictures, many designs and colorings in wall papers would never be chosen (Fig. 16). The plain or soft-toned papers in neutral colorings make the best backgrounds (Fig. 17). Various flowers suit various moods, different occasions, different rooms. The flowers that supply the most charming and intimate features of the home breakfast table would probably be out of place at a banquet.

In decorating a church, a hall, or a home for some special occasion, or even when decorating a temporary structure, such as a band stand or a booth at a fair, many mistakes would easily be avoided if the structure of the building were taken as a guide. It is a principle in art to decorate construction rather than to construct decoration. A rude dining room on the Maine seacoast, with unplaned posts and crossbeams, was trans-

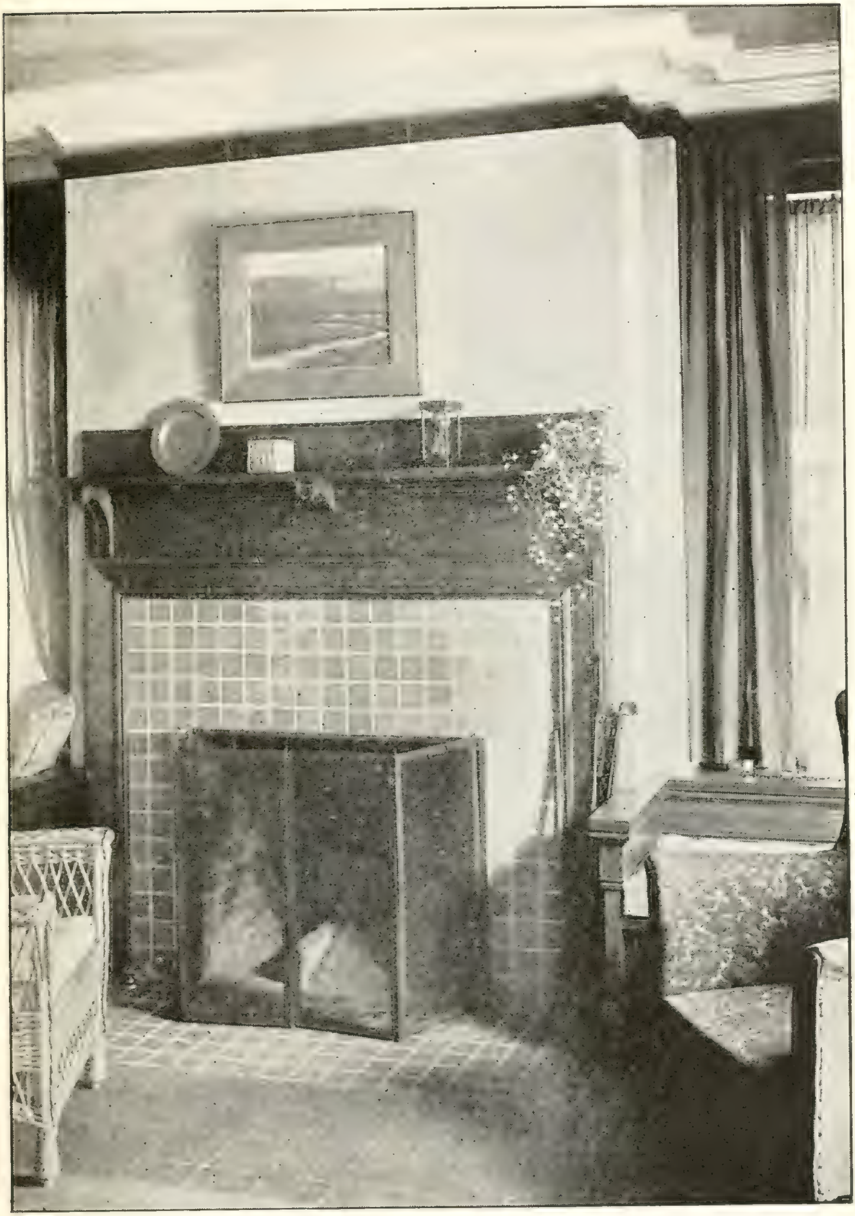

FIG. 15.—*Drooping branches or vines arrange themselves naturally when placed on a mantelpiece*

formed into a handsome banquet hall by covering the important structural features with the bayberry shrubs that grow abundantly in that vicinity.

FIG. 16.—*If the walls of the room were thought of as the background for flowers and pictures, many designs and colorings in wall paper would never be chosen*

Usually there is a reason for emphasizing the decoration in one place more than in any other, as the pulpit end of the church, the platform at a graduation, the place of ceremony at a wedding. If there is no reason for decorating some special place, and if the room does not suggest it, a center of interest should be assumed somewhere for the sake of the better effect produced by a dominating feature.

No phase of flower arrangement is more constantly recurring than that of table decoration. The restraint and the simplicity now recognized as marks of refinement in the preparation and serving of meals, in contrast to the table overloaded with a great variety of food, which was the exaggerated expression of old Saxon hospitality, should also characterize the decoration of the table. Beauty resides in quality rather than in quantity, and is often more in evidence when

stem and leaf and growth are seen than when these have been obliterated by a mere mass of color. Table decoration should be low so that conversation may be general, and so that persons sitting opposite each other need not play hide and seek. Flowers with a very delicate odor, or with no odor at all, should be selected for the table.

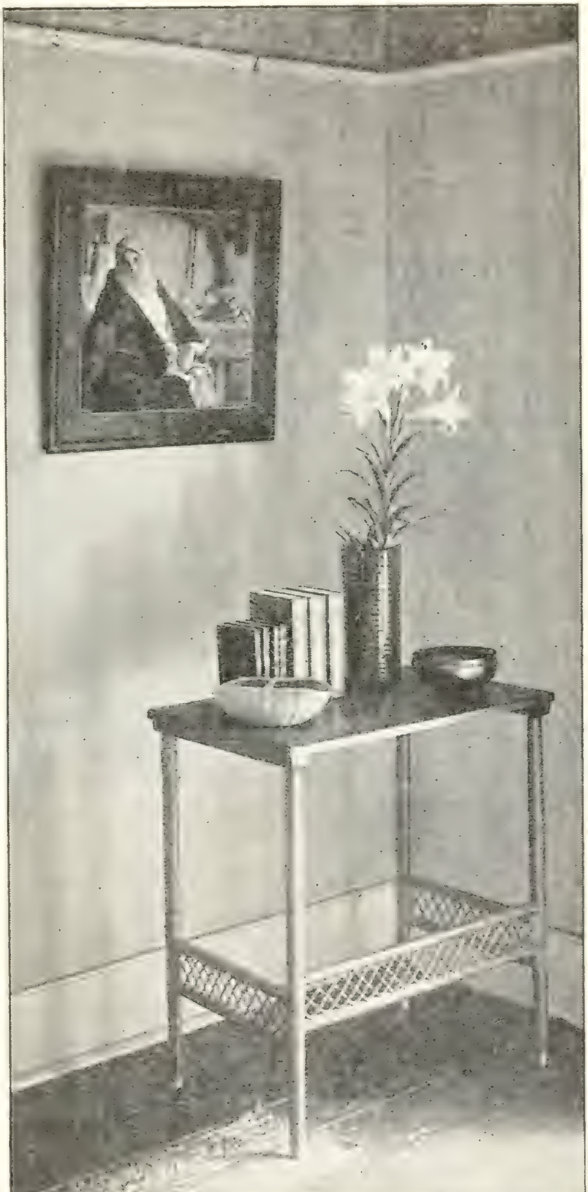

FIG. 17.—*The plain or soft-toned papers in neutral colorings make the best backgrounds*

If the table were the size of King Arthur's round table or of the large central table in a great banqueting hall, treelike masses with slender vases to support the stems, or, better still, baskets hanging above the height of heads, would be good, though the room as a whole rather than the table would be affected by such an arrangement. However, decoration for the home table and for village fêtes is the chief concern in this lesson. Garlands of flowers or vines wandering in and out among the dishes, or any forms of decoration that interfere with service, are out of place.

There may be either a central arrangement (Fig. 18) or something at each plate, or, for a

very special occasion, a combination of both (Fig. 19). Little flat water cups, such as are shown in figure 19, cost only forty cents a dozen and are very appropriate for certain flowers. For a small table one low central composition is usually most desirable. For a long table there may be a central arrangement and others that are subordinate. The shape of the centerpiece should repeat the shape of the table; it should be round for a round table, or long and narrow if the table is that shape. The color of the flowers should harmonize with the color of the china and of the room. The decorations should be appropriate to the occasion and should reflect its spirit. Forget-me-nots, daisies, and buttercups are suitable

FIG. 18.—*The shape of the centerpiece should repeat the shape of the table; it should be round for a round table, or long and narrow if the table is that shape*

for the child's birthday; rosebuds, wild clematis, or virgin's bower, sweet peas, and daffodils for a young girl, unless lilies, marigolds, black-eyed susans, peach blossoms, iris, or other flowers in season happen to have a happier significance. Bride's roses, lilies of the valley, apple, peach, or any other fruit blossoms, are a good selection for the bride. For the mother's birthday, violets, many of the roses, and other flowers, among which her favorite should be given first choice, would be appropriate. Bachelor's-buttons, sweet williams, or johnny-jump-ups may suitably celebrate the young man's coming of age. Laurel, oak leaves, chrysanthemums (a court flower and one associated with longevity in Japan), and other stately blossoms would be appropriate decorations for a dinner in honor of a town or state official or the victor in a village tournament

or other contest. In Japan certain flowers each month are considered especially felicitous. All this symbolism is in line with Emerson's suggestion:

Let statue, picture, park and hall,
Ballad, flag and festival
The past restore, the day adorn,
And make to-morrow a new morn.

MANNER OF ARRANGEMENT

As in other forms of design there must first be an idea to express. To the expression of the idea every blossom, leaf, and stem, the spaces between

FIG. 19.—*There may be a central arrangement, or something at each plate, or, for a very special occasion, a combination of both*

them, the receptacle containing them, and the decoration on the receptacle, if there is any, should contribute.

The decorative elements in plants are line, form, and color. Those plants whose chief attraction is in form or line should be used singly or in small groups so that these qualities may be seen to best advantage. Those whose preeminent attraction is their color may be massed. Those, which are thrice blessed, possessing beauty of form, line, and color may be arranged singly, in small groups, or in large masses, according to the characteristic to be emphasized or the place and the purpose for which they are chosen.

Line is the dominant attribute of goldenrod. One stem, or at most three, is more effective than a large mass. When goldenrod is bunched

in the usual manner, the forceful grace of its wandlike stem is lost entirely; also the greenish yellow of the flowers as seen in mass is disappointing.

In orchids, lilies, and iris, form is the chief element of beauty and should have first consideration. Such flowers should never be massed.

FIG. 20.— *Peonies are difficult to arrange singly and are much more splendid massed*

Color is the dominant attraction in pansies, sweet peas, violets, and nasturtiums; therefore the more of these the better. Peonies are difficult to arrange singly and are much more splendid when massed (Fig. 20).

In many plants form and color are both so attractive that the plant may be selected for either characteristic, but in the decorative arrangement one idea should be dominant.

The rose is one of the best examples of threefold adaptability. One long-stemmed rose in a slender vase, which will keep it in position, is a thing of beauty in line, which should give joy to a whole household (Fig. 23); a group of three at different stages of opening, with their leaves, is an example of beauty of form, which would furnish a notable decoration; and a mass of full-blown roses would present a glory of color, which might well be the special decorative feature at a wedding, a graduation, or a church service in June. The chrysanthemum and the poppy are almost equally adaptable.

In some cases foliage is the attractive feature, and it possesses the same elements of line, form, and color. Rushes and grasses are lovely in line. Some varieties of oak are so impressive in form that they should be

arranged so that the shape of each leaf in the spray may be seen. The acanthus and the ivy have furnished inspiration for generations of sculptors. The begonia and many varieties of autumn foliage rival flowers in brilliancy of color; more often, however, foliage is the background and should be subordinate to flowers. In many cases it is necessary to remove some of the leaves so that they do not compete with the flowers in interest. Carnations should preferably be arranged with their own foliage. Often they come from the florist accompanied by asparagus or sword ferns, a combination incongruous in both form and color. Perhaps some day a lover of carnations will develop a variety of them profuse in leafage and will grow it to furnish foliage for the flowering varieties. Nature is very careful about the foliage she uses with flowers, and uses a different green with white lilacs from the one she uses with the colored species. At times she sends the flowers before the leaves, as in the case of the azaleas and many of the fruit blossoms, so that the contrasting character of the erratic stems is not missed. There are always leaves when violets and sweet peas and nasturtiums blossom. Fewer blossoms

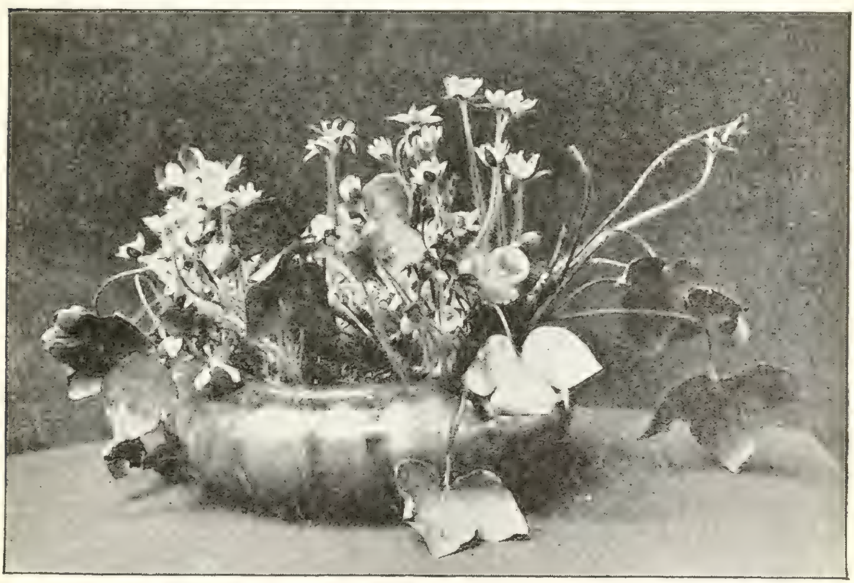

FIG. 21.—*Violets or hepaticas, ripple grass or dandelions, carefully selected and sometimes pruned, are charming*

with a little of the foliage make a much more attractive arrangement than a mass of blossoms and no leaves. Even though buds must be picked with the blossoms in order to secure enough foliage, it should be considered no sacrifice since they, too, contribute to the general effect,

The nature of the plant growth should suggest the manner of arrangement. Branches of trees should be arranged so that their strong, rugged character is preserved. Vines should appear to run or droop or climb. When grace and delicacy distinguish plants these characteristics should not be lost in arrangement.

Whole plants, such as the primrose (Fig. 22), the cyclamen, and many bulbs, such as daffodils, jonquils, and tulips, furnish a ready-made arrangement difficult to equal. Violets or hepaticas, ripple grass or dandelions, carefully selected and sometimes judiciously pruned, are charming (Fig. 21). One bit of sod from a New England pasture has been known to furnish ten varieties of plants, and is a wild garden in itself. Taken early in March and brought into the favoring warmth of the house, it is a prophecy of the spring easily read by a family of children, who receive thereby a vision of the beauty of a little grass plant not so easily perceived when the plants come in battalions.

The life history of the plant may be implied by flower, bud, and pod, as in the poppy (Fig. 24), or the habitat may be suggested, as in the arrangement of buttercups and grasses (Fig. 26). Clover and daisies also feel at home among the grasses, as do poppies and cornflowers in the grain. Water plants are in their element literally when arranged in a large, flat bowl of water. Other plants whose attraction is in their form of growth look well in such a receptacle, for the broad, low lines, in the case of land plants, stand for the ground (Fig. 18). The perforated glass holders (Fig. 11, f), which may be obtained at almost any department store, are very helpful in such arrangements. By means of these or the Japanese supports (Fig. 13, front center) in the bottom of a jardiniere, it is possible to make more characteristic arrangements with fewer branches than it has been the custom to employ. The use of these and other ingenious supports for the stems is an art in Japan, where the arrangement of flowers has its literature and professors and is considered no mean employment for persons in the highest ranks of society. Just such effects may be obtained by strips of lead bent in various ways, by filling the bowl or the receptacle with sand or small stones, or by using forked or split sticks fitted tightly across the bowl or the vase so as to hold the stem or the branches threaded through them firmly in place.

THE RELATION OF FLOWER ARRANGEMENT TO THE PRINCIPLES OF DESIGN

It is a matter of common experience that a thoughtful combining of objects or materials will in general be more satisfactory than a thoughtless, haphazard one. When order, reason, and thought for the finished effect control any arrangement, the result becomes what is technically called a design. Any one may learn to apply design to such everyday problems

as the arrangement of furniture, of a dinner table, or of a bunch of flowers, if a few essentials, or principles, of design are kept in mind. Summed

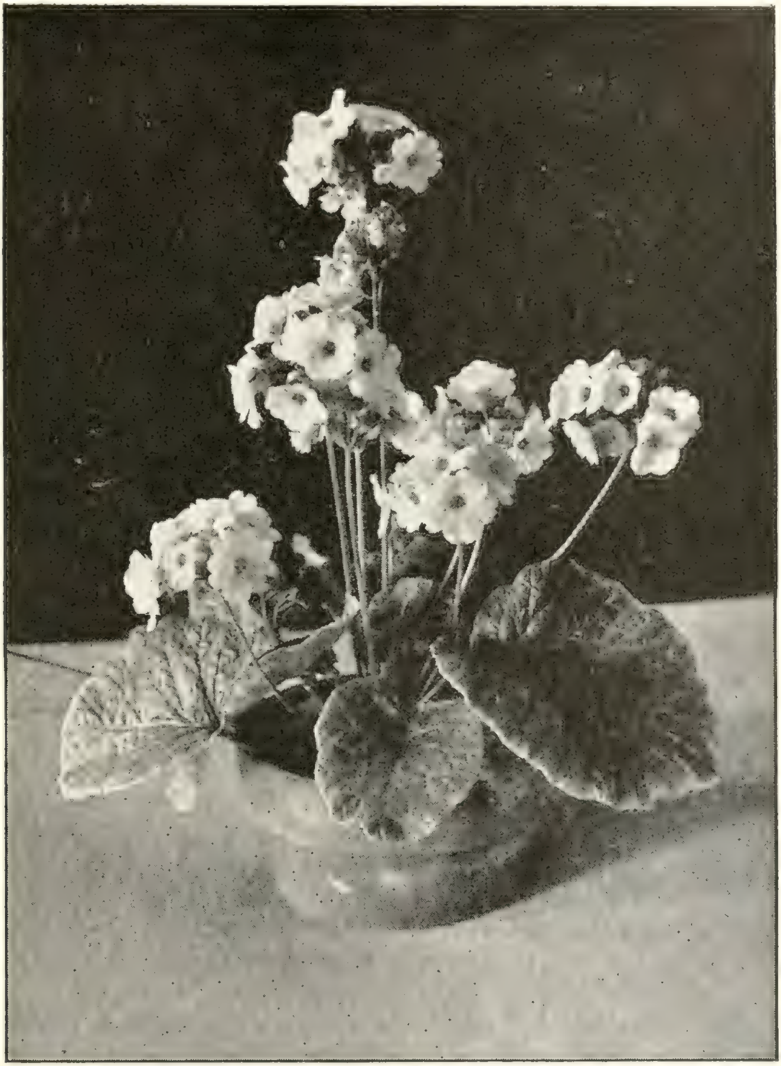

FIG. 22.—*Whole plants, such as the primrose, the cyclamen, and many bulbs, such as daffodils, jonquils, and tulips, furnish a ready-made arrangement difficult to equal*

up in simple form, the principles may be expressed by three terms: harmony, balance, and rhythm.

Harmony.— Harmony implies a degree of likeness, relationship, or congeniality between parts. This is more easily obtained by the use of one than of several kinds of plants, for in nature there is a degree of harmony in the different parts of one plant. The line of leaf, stem, and flower is the common bond in the lily. The same is true of the goldenrod. Color in the foliage of many plants changes after the blossoms disappear and again when the fruit is ripe; constantly there is harmony between blossoms, fruit, and leaves. When apple trees bloom, there are very few leaves, and those are a grayed tint of yellow-green. When the blossoms fall, the leaves become a deeper, more vivid green. As the fruit ripens, the leaves lose their summer brilliancy, thus subordinating themselves to the fruit.

FIG. 23.— *One long-stemmed rose in a slender vase is a thing of beauty in line*

Texture is another characteristic that enters into the making of a harmonious flower arrangement. The texture of the hyacinth blossom harmonizes with the texture of its leaves, and the texture of the geranium with that of its leaves; but the foliage of these plants could not be interchanged effectively.

The receptacle should have some element in common with the plant in a perfectly harmonious arrangement. In figure 20 the rounded bowl harmonizes in shape with the form of the peonies; in figure 23 the tall, slim vase is in keeping with the slender grace of the rose. The second vase in figure 13 is well adapted to the wandlike variety of goldenrod. If the general shape of the plant arrangement is short and rounded, low, broad, bulbous vases are good. If the bouquet is tall and slender, the vase should be that shape. In figure 26 both the color and the decoration of the bowl harmonize with the sod from which the buttercups and the grasses grew.

Balance.— Balance is concerned with stability. The arrangement when complete should look secure, that is, it should not look top-heavy or lopsided. This does not imply a symmetrical arrangement in which the opposite sides of the bouquet are alike, but rather a natural, easy grouping of varying masses and lengths, such as nature affords. This principle is well illustrated by the familiar seesaw, in which equal weights balance at equal distances from the center, and unequal weights at unequal distances from the center. In flower arrangements equal or similar masses of color or form arranged symmetrically would present a formal aspect agreeable in the appearance of a building, in furniture, and in many forms of permanent construction, but not in accord with the free, picturesque balance favored by nature. Therefore, while one should aim for an arrangement that looks secure, single blossoms or masses should be disposed freely at unequal distances from the center. Large or brilliant blossoms or masses placed nearer the center, as is the heavier body in the seesaw, may be balanced by smaller or less brilliant or more scattered blossoms farther from the center.

FIG. 24.— *The life history of the plant may be implied by flower, bud, and pod*

Rhythm.—Rhythm has been variously defined and explained, but it always implies a measured or a regular difference of some kind. This difference may range from small to large in blossoms, foliage, fruits, or other masses; from short to long in stems or spaces (Fig. 25); from less to greater in curve or angle (Fig. 25, 4 and 6); from white through deepening tints as in the varying tones of pink in peonies and roses, or through a series of hues as in the gradations of color from yellow to

orange in nasturtiums or calendulas or from blue to violet in sweet peas or pansies.

Often flowers borne singly, such as carnations or chrysanthemums, daisies or lilies, are cut with stems the same length and placed without thought in a vase. A feeling for rhythm would lead one to cut the stems in different, related lengths; then the flowers of themselves would fall into a fairly agreeable arrangement.

This principle of rhythm is observed in many arrangements made by the Japanese and is secured by them by the use of poetical symbolism, which gives fanciful names, such as man and woman, or principal and support, to the important and less important features in a two-stem arrangement (Fig. 25, 1); principal, secondary, and tertiary, or father, mother, and child, or heaven, earth, and man, to the three-stem arrange-

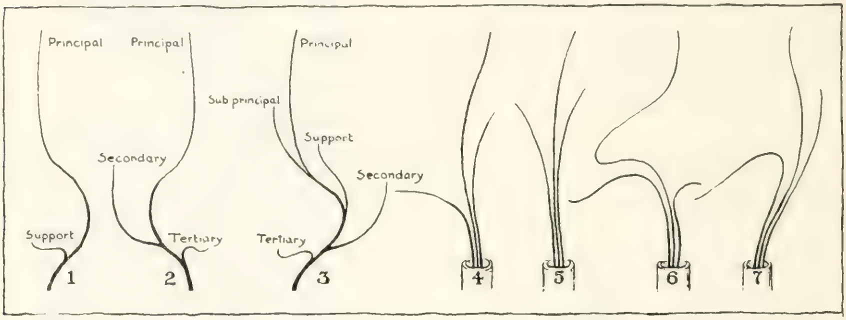

FIG. 25.— *Japanese flower arrangements: 1, two-line arrangement; 2, three-line arrangement; 3, five-line arrangement; 4, 5, 6, 7, various three-line arrangements*

ment (Fig. 25, 2, 4, 5, 6, 7); center, north, south, east, and west, or earth, fire, water, metal, and wood, or heart, help, the guest, skill, and the finishing touch, to the five-part arrangement (Fig. 25, 3), according to the school or the nature of the arrangement.

But, remarkable as these arrangements are, it is not necessary to study oriental symbolism or legend or custom to make others that are equally good. The principles of art are fundamental and eternal; they know no Orient nor Occident. Their forms of expression, to be sure, may vary according to the people, the climate, and the age, but in the last analysis any artistic product measures its worth according to its obedience to these principles. They are obeyed as implicitly in a good arrangement of flowers as in the making of any other good design. These principles, like the Japanese symbolism, mean simply that in a good arrangement of flowers there should always be a dominant, or central, feature — blossom or mass or line — that the other features should be rhythmically related to it,

FIG. 26.—*The habitat of the plant may be suggested, as in this arrangement of buttercups and grasses*

that the whole should be balanced on a central vertical in order to constitute with the receptacle a harmony in line, form, and color, which will appeal to the eye as a unit.

A LIST OF FLOWERS

The following list of flowers was arranged by a women's club for the decoration of a country church with gray and ivory walls, and red pew cushions and carpet:

March

WILD FLOWERS

Pussy willow (*Salix cordata*)
Alder (*Alnus serrulata*)

April

WILD FLOWERS

Marsh marigold, or cowslips (*Caltha palustris*)
Shadbush, or June berry (*Amelanchier canadensis*)

GARDEN FLOWERS

Daffodil (*Narcissus pseudonarcissus*)
Poet's narcissus (*Narcissus poeticus*)
Forsythia (Forsythia), various species
Cydonia: scarlet japonica, or Japanese quince (*Cydonia japonica*), and other species
Tulips (Tulipa), various species

May

WILD FLOWERS

Hobblebush (*Viburnum lantanoides*)
Flowering dogwood (*Cornus florida*)
American crab apple (*Pyrus coronaria*)
Purple azalea, or pinkster flower (*Rhododendron nudiflorum*)
Red maple (*Acer rubrum*). Use the winged fruit, the keys
Hawthorn (*Cratægus coccinea; C. crus-galli; C. tomentosa*)

GARDEN FLOWERS

White lilac (*Syringa vulgaris* var. *alba*)
Viburnum (*Viburnum lantana* or *V. rugosum*)
Common apple (*Pyrus malus*)
Iris (Iris), various species. *Iris fragrans*, a beautiful white species
Lily of the valley (*Convallaria majalis*)
Wistaria (Wisteria), various species
Common horse-chestnut (*Æsculus hippocastanum*)
Spiræa (*Spiræa arguta; S. prunifolia; S. thunbergii*)

June

WILD FLOWERS

Tall buttercup (*Ranunculus acris*)
Black-berried elder (*Sambucus canadensis*)
Dwarf wild rose (*Rosa lucida*)
Early wild rose (*Rosa blanda*)
Sweetbrier (*Rosa rubiginosa*)
Coneflower (*Rudbeckia hirta*)
Oxeye daisy (*Chrysanthemum leucanthemum*)
Mountain laurel (*Kalmia latifolia*)

GARDEN FLOWERS

Peony (Pæonia), various species
Rose (Rosa), various species
Delphinium (Delphinium) larkspur
Canterbury bells (*Campanula medium*)
Old-fashioned snowball (*Viburnum opulus* var. *sterilis*)
Japanese snowball (*Viburnum plicatum*)
Spiræa (*Spiræa vanhouttei*)

WILD FLOWERS	GARDEN FLOWERS
	July
Meadow lily (*Lilium canadense*)	Spanish bayonet (*Yucca filamentosa*)
American Turk's-cap lily (*Lilium superbum*)	Golden glow (*Rudbeckia speciosa* var. *flore pleno*)
Tall meadow rue (*Thalictrum polygamum*)	Spiræa (*Spiræa salicifolia; S. sorbifolia; S. discolor* var. *ariæfolia*)
	August
Staghorn sumac (*Rhus typhina*) with fruit	Salpiglossis (Salpiglossis), various species
Goldenrod (Solidago), various species	Blanket flower (Gaillardia), various species
Queen Anne's lace (*Daucus carota*)	Zinnia (Zinnia), various species
Common barberry (*Berberis vulgaris*). The fruit very decorative from August to November	Hydrangea (*Hydrangea arborescens* var. *grandiflora alba*)
Virgin's bower (*Clematis virginiana*). The flowers beautiful in August; the fruit in September	
	September
Sumac (*Rhus typhina*), autumn coloring	China aster (Callistephus), various species
High blackberry (*Rubus villosus*), autumn coloring	Scarlet sage (*Salvia splendens*)
Aster (Aster), various species	Dahlia (Dahlia), various species
American mountain ash (*Pyrus americana*), fruit	Marigold (*Calendula officinalis*)
	Gladiolus (Gladiolus)
	Grapevine (Vitis)
	Japanese barberry (*Berberis thunbergii*). Foliage decorative through September and October
	October
Bittersweet (*Celastrus scandens*)	Chrysanthemum (Chrysanthemum), various species
Red maple (*Acer rubrum*)	Cosmos (Cosmos), various species
Sugar maple (*Acer saccharinum*)	
Oak (Quercus), various species	

THE CORNELL READING COURSE FOR THE FARM HOME

This course was instituted so that the problems of the farm home could be studied in the same scientific way as are those of the farm. The lessons are on such household subjects as relate to food, shelter, and clothing, and are generally accompanied by discussion papers, which contain questions that bring out the point of view of the practical housekeeper As a result there has been a large personal correspondence with the women of the State, who are at liberty to ask questions at any time relating to their home

problems. The Reading Course for the Farm Home is free to residents of New York State. A lesson is issued each month. For further information address the Department of Home Economics, College of Agriculture, Ithaca, New York.

The lessons available in the Cornell Reading Course for the Farm Home are as follows:

15 Principles of jelly-making
17 The preservation of food in the home.— Part I
19 The preservation of food in the home.— Part II
21 The preservation of food in the home.— Part III
23 Rules for cleaning
25 Saving strength
27 Choice and care of utensils
29 Cost of food
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BEANS AND SIMILAR VEGETABLES AS FOOD

LUCILE BREWER AND HELEN CANON

BEANS and other plants of the legume family are of immense importance because of their ability to furnish nitrogen to the soil, to animals, and to human beings.[1] Certain microorganisms living in the roots of rightly cultivated legumes take up nitrogen from the air and furnish it to the plant body. The plant is then either plowed under or gathered for food. If it is plowed under, the nitrogen increases the fertility of the soil; if it is used as a forage crop or a human food, the nitrogen furnishes material for building animal tissue.

The legumes that are most commonly used for human food are the bean, the pea, the lentil, and the peanut. These foods deserve an important place in the dietary because they furnish the body with material for the development and the repair of tissues, they help to keep the body in good running-order, and, generally speaking, they are cheaper than other protein foods. The extent to which the nutrients of the legumes may be used by the body, as well as the ease with which they may be digested, is influenced by the method of cooking them. Their value has long been recognized.

LONG AND EXTENSIVE USE OF LEGUMES AS FOOD

Beans and peas have been used as human food since early times. According to historical records, beans were cultivated by the Egyptians, the Greeks, and the Romans. Peas do not seem to have been known to the Greeks and the Romans. They were introduced into Europe in the Middle Ages, but even in the time of Queen Elizabeth the English obtained them only from Holland and considered them " a dainty dish for ladies, they

[1] For suggestions in regard to the cultivation of beans and peas, the reader is referred to *Raising Vegetables for Canning*, by Albert E. Wilkinson, Reading Course Lesson for the Farm Home, No. 83.

came so far and cost so dear." It is said that before 1600 A. D. beans were cultivated on this continent as far north as the St. Lawrence River. It is evident that both beans and peas have been cultivated by the Indians of North and South America at least since the time of the early voyages of the white men to this continent. Of local interest is the fact that in the United States beans were first grown commercially in Orleans County, New York, in 1839.

The cowpea and the soy bean have only within recent years come into common use in this country. As yet they are being planted chiefly for their value as a fertilizer and a forage crop, although the people of the Southern States are beginning to realize the value of these two legumes as a human food. The cowpea was introduced into this country from the West Indies about two hundred years ago, and there is a record of its having been planted on George Washington's farm about 1797. It was long ago used in China, and it was known in Asia Minor and Arabia as early as the beginning of the Christian era. The cowpea is said to be the chief leguminous crop of the Southern States.

The first reference to the soy bean in American literature was in 1829; it had been grown in the botanical garden at Cambridge, Massachusetts, and was referred to as "a luxury, affording the well-known sauce, soy, which at this time is only prepared in China and Japan." About twenty-five years later, seed of the soy bean, or Japan pea as it was then called, was brought from Japan to California, and thence to Illinois and Ohio. Within the last twenty-five years, it has come to be a crop of great economic importance in the United States.

The lentil was probably one of the first plants to be brought under cultivation. It is thought that the "red pottage" of Esau may have been made from the reddish Egyptian lentil. The plant is a native of the Mediterranean region. It is cultivated in Egypt and the East, and in southern Europe, although not so extensively there as the pea and the bean. On this continent, a small variety is grown in Mexico and the southwestern section of the United States, but practically all the lentils on the market are imported. With the increase of foreign population in the United States, the use of lentils is steadily increasing.

The peanut, popularly classed with the nuts, is thought to be a native of tropical America. It has long been grown in Africa, the East Indies, China, and Japan. It is said that in the seventeenth century it had become so important an article of food in Africa that the slave dealers loaded their vessels with it as food for their captives. Since the Civil War, the peanut has become important in the Southern States as a human food, a forage crop, and a fertilizer.

NUTRITIVE VALUE

In a discussion of the nutritive value of a food it is not sufficient to consider only the amounts and the properties of the various nutrients contained; of equal importance is the extent to which these nutrients may be used by the body, or, in other words, their digestibility. Hence, a conclusion in regard to the nutritive value of the legumes must rest on a consideration of their digestibility as well as of their composition.

Nutrients contained by the legumes

The legumes are called a protein food because of their high protein content; like many other vegetable foods, however, the majority of them show a high percentage of carbohydrate. Soy beans are conspicuously lacking in carbohydrate, and for this reason they are of use in diabetic dietaries. Peanuts are characterized among the legumes by their high fat content, which has caused their extensive use commercially for the manufacture of peanut oil and peanut butter. Protein is used by the body for the development and the repair of tissue; it is also a source of energy, but in a properly balanced dietary it should furnish only from 10 to 15 per cent of the total energy value, the rest being supplied by carbohydrates and fats.

In addition to furnishing protein and energy-giving substances in large proportions, the legumes are a valuable source of potassium, phosphorus, iron, and calcium. Like milk, fruit, and vegetables in general, the legumes, with the exception of peanuts and lentils, belong to the group of foods that are so necessary in the diet for the purpose of preventing an excess of acid in the system, which condition might arise from a too exclusive use of meat, eggs, and cereals.

Composition of the various forms of legumes.—The percentage composition of the legumes is influenced by the form in which they are used. Thus, the forms in most common use are: (1) in the pod, such as string beans; (2) shelled, such as green peas and green lima beans; (3) shelled and dried, such as navy beans, kidney beans, lima beans, peas, and lentils. In a given weight of these three forms there is the least amount of water in those that are dried; consequently, the percentage of protein and other nutrients is higher than in the case of the fresh legumes. The added amount of carbohydrate contained in the pods also tends to decrease the percentage of protein in the fresh, unshelled legume, such as the string bean. This concentration of nutrients is shown in the dried bean, for example, which contains 22.5 per cent protein in contrast to 2.3 per cent contained by the fresh string bean.

Although the green legumes do not show so high a concentration of nutriment as do the dried legumes, their value in the diet must not be

underestimated. Like the other green vegetables, by virtue of their bulk they serve an important function in hastening waste products along the intestinal tract; and they are an important source of the ash, or mineral, constituents so necessary in the diet.

Composition of legumes as compared with that of other foods.— In the green state, legumes either equal or surpass other green vegetables in nutritive value. In the matured, dried state they show even a higher proportion of protein than is shown by some of the other so-called protein foods, such as meat, eggs, and nuts; however, in general they do not show so high a proportion of protein as is shown by cheese. In fuel value dried legumes somewhat surpass meat and greatly surpass eggs.

Digestibility

On the other hand, experience has revealed the fact that legumes, especially in the dried state, may be somewhat difficult to digest. They often produce a feeling of flatulence on account of the formation of an excess of gas, and they have consequently been termed an " indigestible " food.

It is true that the protein of legumes is not so completely utilized as are other proteins, and that it requires more work on the part of the digestive tract to digest it. However, as explained further on, favorable dietary conditions may increase the amount of the legume protein available for use by the body. Of course, as is the case with many foods, the protein of legumes is more thoroughly and more easily digested by some persons than by others.

Evidence from dietary habits.— Among the rural classes of Japan, meat is used only on special feast days, perhaps not more than three or four times a year; milk is used there scarcely at all, and fish only infrequently by those who live inland. Their chief source of protein is the soy bean, conspicuous among the legumes for its high proportions of protein and fat. In Japan the soy bean is grown almost entirely for human food. According to Mr. Oshima,[2] next to rice in the Japanese diet are the legumes, which are universally used. Likewise the peasants of many of the European countries are dependent on vegetable sources, such as the legumes and the cereals, for their supply of protein. The lumbermen in the Maine woods, at severe labor during cold weather, were found to obtain about 60 per cent of their total protein from vegetable sources, chief of which was baked beans. Even though the beans were eaten twice a day generally, under these conditions of active life in the open air no unsatisfactory results were experienced in either digestion or nutrition.

[2] Kintaro Oshima. A digest of Japanese investigations on the nutrition of man. Bulletin 159, U. S. Office of Experiment Stations. 1905.

Methods of rendering legumes most digestible

Favorable conditions for the greatest utilization of the protein of the dried legumes require: (1) the removal of the skins; (2) thorough cooking in soft water to which a small amount of soda has been added; (3) their moderate use in combination with other foods in a meal.

With the removal of the skins, some of the germ is also removed; it is believed that these are the parts of the legume that cause the formation of gas by fermenting in the intestine. Persons in good health, leading an active life, seldom experience any discomfort from eating the skins; but since there is the possibility of discomfort, especially on the part of less robust persons and of those engaged in sedentary occupations, the removal of the skins is often advisable and, as described further on, requires very little additional time or work. In addition to rendering the beans more easily digestible, the removal of the skins renders them more thoroughly digestible, because the bulk furnished by the skins, as well as the formation of gas resulting from their fermentation, may cause the food to be hastened along the alimentary tract to such an extent that there is not sufficient time for the greatest extraction of the nutrients.

Thorough cooking is necessary in order to break down the cell walls of the plant and thus render the protein more accessible to the digestive juices. The amount of protein available when legumes are cooked in soft water has been found to be reduced 7 per cent when they are cooked in hard water. A small amount of soda used in cooking legumes, aids in rendering the protein more digestible and in softening the water.

Experiments have shown that more of the protein of the legumes is utilized when they form part of a mixed diet and are eaten in a moderate quantity than when they are eaten alone and to excess. Therefore, it is obviously wise not to make them the sole article of food in a meal, but to combine them with other foods, especially those of less concentration, such as green vegetables and fruits.

Roasted peanuts should not be eaten alone in too great an abundance, and they should be thoroughly masticated. Difficulty in digesting peanuts may be caused in part by their high concentration of nutriment, as well as by the fact that a large amount of fat in combination with protein tends to retard digestion in the stomach, which is the part of the alimentary tract where one is most conscious of the digestive processes.

COST

Under ordinary conditions dried legumes are the cheapest source of protein. For the purpose of reducing the cost of a diet they may very satisfactorily, in part, take the place of meat. Ten cents spent for dried

legumes will obtain from two to three times as much protein as if spent for meat at an average price. Moreover, a variety in the kind of protein supplied to the body is desirable in a proper diet. If other protein foods were substituted in part for meat in the average dietary, it is thought that conditions would be more favorable to health. The people of the United States consume fully twice as much meat per capita as do the people of Europe. Dietary habits have led too many persons to believe that a meal for a laboring man is incomplete without meat; but this notion has been disproved by various dietary studies, some of which have been already mentioned. The dried legumes may be used advantageously to a much greater extent than at present in this country, particularly by out-of-door workers and during the colder months, under which conditions an increased amount of protein in the dietary is permissible.

WHAT TEN CENTS WILL BUY IN GRAMS

(One gram equals about one-twenty-eighth of an ounce)

Food	Protein (grams)	Calories	Calcium, reckoned as CaO (grams)	Potassium, reckoned as K_2O (grams)	Phosphorus, reckoned as P_2O_5 (grams)	Iron (grams)	Excess	
							Acid	Base
Beans,								
Dried, at 10 cents a pound........	102.06	1,564	.998	6.350	5.171	.0317	....	78.3
String, fresh, at 5 cents a pound.	19.04	352	.680	2.540	1.088	.0144	....	45.7
Lima, dried, at 10 cents a pound...	82.10	1,586	.454	9.525	3.493	.0317	....	190.3
Lima, fresh, at 15 cents a pound...	9.67	167	.121	2.096	.809	.0074	....	19.2
Peas, fresh, at 4 cents a pound..........	40.82	628	.454	3.402	2.948	.0181	....	7.5
Lentils, dried, at 9 cents a pound.....	129.40	1,755	.755	5.286	5.034	.0432	26.3	.....
Peanuts, at 10 cents a quart...........	62.71	1,317	.237	.....	2.107	.0046	9.2	.....
Beef, round, at 22 cents a pound.....	40.16	296	.029	.....	.926	.0059	20.1	.....
Eggs, at 35 cents a dozen............	22.94	253	.152	.....	.607	.0048	19.0	.....
Milk, whole, at 9 cents a quart.....	35.62	774	1.813	1.845	1.079	.0026	....	20.1
Cheese, cheddar, at 25 cents a pound..	50.25	858	2.145	.....	3.346	.....	10.3	.....

The accompanying table shows the amounts of nutrients furnished for a given price by some of the commonly used protein foods. It is in-

teresting to note that dried lentils supply the greatest amount of protein and energy for a given cost. The amounts of potassium, phosphorus, and iron furnished by the dried legumes are conspicuously large. The contrast between the fresh legumes and the other foods as to the amounts of protein and energy furnished might be misleading were it not recalled that the green vegetables are particularly valuable in the diet on account of their bulk, their ash constituents, and their excess of base-forming elements.

THE COOKING OF LEGUMES

As is the case with other fresh vegetables, the sooner green peas and beans are cooked after they are gathered, the better will be the result. In an investigation made in a cannery, it was learned that the sugar content of green peas increases slightly after the vines are cut and while the peas still remain in the pod, but that after the peas are removed from the pod their sugar content begins to decrease. From this evidence the conclusion is drawn that if the full sweetness is desired, it is not a good practice to shell the peas in the morning and allow them to stand until evening before cooking them. Green peas and beans should be cooked only until tender; if they are overcooked, they lose much of their palatability, as well as their fresh green color.

The unfavorable influence of the skins of dried legumes on the ease and the completeness of digestion has been referred to. The fact that the skins prevent the body from getting the greatest possible amount of nutriment from the food should cause one to consider whether the time required for removing the skins or the food thereby rendered useful to the body is the more valuable. The skin is more easily removed from the dried pea and the lentil than from the bean. The skins of beans may be easily removed by cooking the beans in rapidly boiling water with a small amount of soda for about thirty minutes, then lifting them out into cold water and rubbing them together. For soups and other dishes calling for bean pulp, the skins may quickly be removed by rubbing the beans through a sieve.

Unless the water in which the legumes are cooked is to be used, the salt should not be added until toward the end of the cooking process, because a dilute salt solution extracts more of the protein than does fresh water. Retention of the protein is aided by its coagulation by heat before the addition of the salt. In an experiment with mature peas it was found that a dilute salt solution extracted 8 per cent more protein than did fresh water. This applies in a greater or less measure to all protein foods.

The dried legumes are usually soaked in water for at least eight hours before being cooked, in order that they may be softened by gradually

absorbing their original content of moisture. The custom of draining off and discarding the water in which the legumes are soaked or cooked is to be discouraged because the ash content of the food is thus decreased. Occasionally there is a bitter taste extracted by the water, which necessitates its being discarded; especially is this true in the case of lentils. Usually, however, the finished product is equally as palatable when the water used in the soaking is also used in the cooking, as when it is drained off and fresh water is added. Some persons parboil the dried legumes for a few minutes in so strong a soda solution that the water cannot be used. This large amount of soda, however, is unnecessary; a small amount, one-fourth of a teaspoonful of soda to one quart of water, serves to loosen the skins, to render the protein more digestible, and to soften water of average hardness, as will be explained. In the case of the green legumes, one-fourth of a teaspoonful of soda to one quart of green vegetables is the proportion recommended to preserve the fresh green color. As has been shown by scientific investigation, the soda neutralizes the vegetable acids and prevents their destroying the coloring matter as they would otherwise do when heated.

Soft water, either distilled or rain water, is the best in which to soak and cook the legumes. Hard water interferes with their becoming soft, and also with their digestibility. Hardness of water caused by the carbonate of lime or magnesium, may be remedied for use in the cooking of legumes by boiling the water, pouring it from the sediment, and adding a small amount of soda; when the hardness is caused by the sulfate of lime or magnesium, boiling has no effect, but soda may improve it for this purpose.

There is no good reason for discarding the liquor on canned peas that have been put up in glass; it contains nutritive material and should be used. If the peas have been canned in tin, however, the liquor is likely to contain certain tin compounds, which it seems advisable not to introduce into the system.

Fats are often combined with the legumes in such dishes as baked beans and pork, and split peas and bacon. This gives a dish in which protein, fat, and carbohydrate are well represented. Since, as has been mentioned, fat tends to retard the digestion of protein in the stomach, a meal in which the two are combined will tend to postpone the feeling of hunger and consequently is especially good when one wishes food that will " stand by " him, as when there is strenuous outdoor work to be done. Also, fat, as well as vegetables of pronounced flavor, such as onions and tomatoes, improves the flavor of the dried legumes, which by themselves are somewhat flat.

RECIPES FOR USING LEGUMES

In general, the recipes given for dried beans apply also to dried peas and lentils. In like manner the recipes for string beans may be adapted to green peas and green lima beans.

Baked beans

1 pint navy beans
4 pints cold water
½ teaspoonful soda
1 teaspoonful mustard
Salt
¼ pound salt pork
1 tablespoonful minced onion
2 tablespoonfuls molasses
¼ teaspoonful paprika
2 tablespoonfuls tomato sauce

Fig. 27.— *Baked beans*

Wash the beans and soak them overnight in the cold water, to which the soda has been added. Cook them in the same water in which they have been soaked, adding more if necessary, for about thirty minutes, or until the skins slip off easily. Stir the beans until the skins rise to the surface and can be skimmed off. Put the beans into an earthen crock or bean jar; add the salt pork cut in small cubes, the onion, the molasses, and the paprika. Cover the jar, and bake the beans slowly for six or eight hours. Slow cooking develops the flavor. When the beans are

almost done, add the salt and the tomato sauce, which may be made according to the following recipe.

Tomato sauce

1 cupful strained tomato juice	1 bay leaf
1 tablespoonful flour	1 clove
1 tablespoonful butter	Salt and paprika

Melt the butter, add the flour, and rub the mixture to a smooth paste. Add the tomato juice and the seasoning, stir the mixture constantly, and cook it until it thickens.

Boiled dried beans

Wash the beans. Soak them overnight or for about eight hours in four times their quantity of soft water, to which soda has been added in the proportion of one-fourth of a teaspoonful of soda to one quart of water. Remove the skins by stirring the beans in water or, in the case of the large lima beans, by pressing them between the fingers. Cook the beans slowly in the same water, adding more if necessary, for from two to four hours, adding onion or flavoring herbs as may be desired. Add salt to the beans when they are nearly done. Serve with strips of crisp bacon or one tablespoonful of chopped parsley.

If the skins are hard to remove after the beans have been soaked, cooking them for twenty or thirty minutes will usually loosen the skins sufficiently to allow them to be slipped off easily. If the bean pulp is desired for use in other dishes, it is somewhat easier to remove the skins by putting the beans through a sieve after they are cooked than to remove them before the cooking.

Baked-bean loaf

1 pint cold baked beans	1 tablespoonful finely minced onion
1 egg, beaten	2 tablespoonfuls tomato catsup
1 cupful bread crumbs	
Salt and pepper	

Combine the ingredients, and shape the mixture into a loaf. Bake it for twenty-five minutes. Serve with strips of broiled bacon on the top.

FIG. 28.— *Baked-bean loaf*

Bean muffins

2 eggs, well beaten	$\frac{1}{3}$ cupful melted fat
1 cupful cold boiled-bean pulp	1 teaspoonful salt
$\frac{1}{2}$ cupful milk	2 cupfuls flour

2 teaspoonfuls baking powder

Combine the ingredients in the order in which they are given. Bake the muffins in greased muffin pans for twenty or twenty-five minutes. These muffins make a good border for a pot roast served with brown gravy.

FIG. 29.— *Bean muffins*

Bean timbales

1 cupful cold boiled- or baked-bean pulp
1 cupful milk
2 eggs, well beaten
1 tablespoonful melted butter
$\frac{1}{2}$ teaspoonful salt
$\frac{1}{8}$ teaspoonful paprika

FIG. 30.— *Bean timbales*

Combine the ingredients in the order in which they are given. Pour the mixture into custard cups. Set the cups in a pan of hot water. Bake the custard in a moderate oven until it is set.

Bean soup

1 cupful boiled-bean pulp
1 pint milk
1 tablespoonful flour
2 tablespoonfuls butter
1 tablespoonful minced onion
Yolk of 1 egg

Scald the milk and the onion. Melt the butter, add the flour to it, and blend them. Add to this the hot milk, and stir the mixture until it is smooth and thickened; add the bean pulp, and allow the mixture to come to the boiling point. Just before serving, add the well-beaten yolk of egg.

Baked-bean soup

$2\frac{1}{2}$ cupfuls baked beans
3 cupfuls water
1 slice of onion
1 tablespoonful butter
1 tablespoonful flour
$1\frac{1}{2}$ cupfuls milk
Salt and pepper

Follow the directions given under bean soup.

Bean soufflé

1 pint hot boiled-bean pulp
2 eggs
1 teaspoonful onion juice
2 tablespoonfuls finely chopped parsley

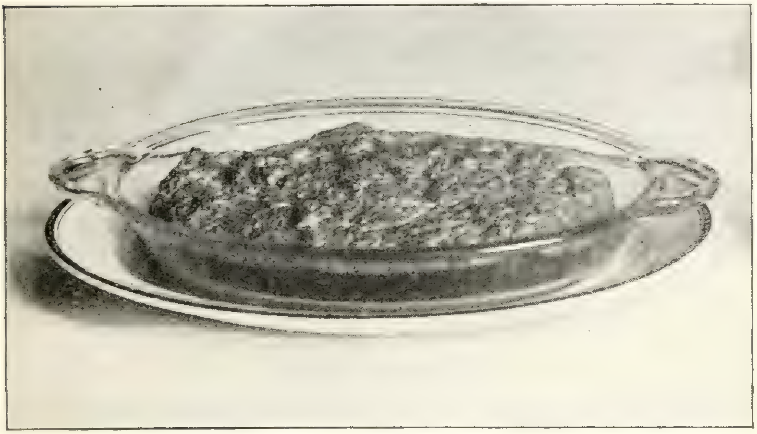

FIG. 31.— *Bean soufflé*

Beat the yolks of the eggs, and add to them the other ingredients. Fold in the well-beaten whites of the eggs. Heap the mixture lightly in a baking dish. Bake it in a slow oven for about twenty minutes or until it is set. Serve it immediately.

Mexican frijoles

Soak about one pint of beans overnight. Boil them for four hours. Melt two tablespoonfuls of lard in a frying pan; add the beans; cook them for ten minutes. Serve with sauce made by the following recipe.

Sauce for frijoles

1 tomato
5 green chilies, minced
1 small onion, minced
$\frac{1}{2}$ teaspoonful salt

Rub the ingredients together until they form a paste. Cook the mixture just long enough for it to become heated through.

FIG. 32.— *Baked-bean croquettes*

Baked-bean croquettes

1 cupful baked-bean pulp	$\frac{1}{2}$ cupful white sauce
1 teaspoonful onion juice	Salt and pepper

Combine the ingredients, and allow them to stand for two or three hours. Shape this mixture into croquettes. Roll them in bread crumbs, beaten egg, and crumbs again; fry them in deep fat.

FIG. 33.— *Bean sandwiches*

FIG. 34.— *Scalloped lima beans*

Bean sandwiches

1 cupful cold baked-bean pulp
1 tablespoonful melted butter or cream
1 teaspoonful finely minced onion
Salad dressing, enough to moisten

Spread the mixture on thin slices of buttered bread.

FIG. 35.— *Bean-crust pies*

Scalloped lima beans

Put a layer of boiled lima beans into a buttered baking-dish. Sprinkle them with salt, pepper, and bread crumbs. Over several such layers pour sufficient white sauce to cover. Sprinkle buttered crumbs over the top. Bake for twenty minutes in a moderate oven.

White sauce

2 tablespoonfuls butter	½ teaspoonful salt
2 tablespoonfuls flour	Pepper
1 cupful milk	

Melt the butter; remove it from the fire; add the flour, the salt, and the pepper; and stir the mixture until it is smooth. Return the mixture to the heat; add the milk; and stir the sauce until it thickens. Cook it for fifteen minutes over boiling water or for five minutes directly over the fire, stirring it constantly.

Bean crust

1 cupful boiled-bean pulp	1 egg, beaten
½ teaspoonful salt	2 tablespoonfuls melted fat
1 teaspoonful baking powder	Flour, enough to make soft dough

Combine the ingredients. Roll out the mixture to about one-eighth of an inch in thickness on a well-floured board. Cut strips of suitable size, when folded, for individual pies. Fill the pies with chopped cooked meat or vegetables. Fold the crust over, and press it together along the edges. Bake the pies in a moderate oven until they are well browned.

Scalloped onions with peanuts

8 medium-sized onions, cooked	1½ cupfuls white sauce
1 cupful peanuts, finely chopped	½ cupful buttered crumbs

Arrange the ingredients in a buttered baking-dish in alternate layers, beginning with a layer of onions. Sprinkle buttered crumbs over the top. Bake in a moderate oven for twenty minutes.

Peanut loaf

1 cupful mashed potato	1 cupful milk
1 cupful finely ground peanuts	2 eggs, beaten
Seasoning	

Combine the ingredients, and shape the mixture into a loaf. Bake it in a moderate oven for twenty minutes.

Lentil-ham loaf

2 cupfuls cooked lentils	1 egg, beaten
2 cupfuls cooked ham, minced	$\frac{1}{2}$ cupful bread crumbs
1 onion, minced	$\frac{1}{2}$ cupful milk
2 tablespoonfuls butter	

Combine the ingredients. Shape the mixture into a loaf. Bake it in a moderate oven for thirty minutes.

Stewed string beans

The beans should be young and tender. Wash them thoroughly, string them, and break them into pieces of the desired length. Plunge them into boiling water to which soda has been added in the proportion of one-fourth of a teaspoonful of soda to one quart of beans. Cook them at simmering temperature only until they are tender. Add the salt when the beans are nearly done. The water should be of such quantity that there will be little to drain off when the cooking is finished. Any such water may be used in soups or sauces.

Stuffed peppers

1 pint cooked string beans, chopped	4 tablespoonfuls finely minced bacon
$\frac{1}{2}$ cupful tomatoes	2 hard-cooked eggs, minced
1 small onion, minced	Salt and paprika
$\frac{1}{2}$ cupful bread crumbs	Green peppers

Cut the green peppers lengthwise; remove all the seeds. Mix the remaining ingredients well. Fill the pepper cups with the mixture; sprinkle buttered crumbs over the tops; place in a shallow pan. Add sufficient boiling water to half cover the peppers, and bake them in a moderate oven until they are tender.

Canned string beans, lima beans, and peas

String beans, fresh lima beans, and peas may be successfully canned for winter use by following the directions for canning that are given in *Canning Clubs in New York State.— Part II*, Reading Course Lesson for the Farm Home, Vol. III, No. 69.

Lima bean salad

Recipe I

Line a salad dish with lettuce leaves. Fill it with cold boiled lima beans. Arrange sliced fresh tomatoes around the beans as a border. Serve the salad with French dressing or boiled dressing.

Recipe II

1 pint cold boiled lima beans
1 small onion, minced
1 pimento, cut in small pieces
¼ teaspoonful celery salt
Salt and pepper

Mix the ingredients well with boiled salad dressing. Serve the salad on lettuce.

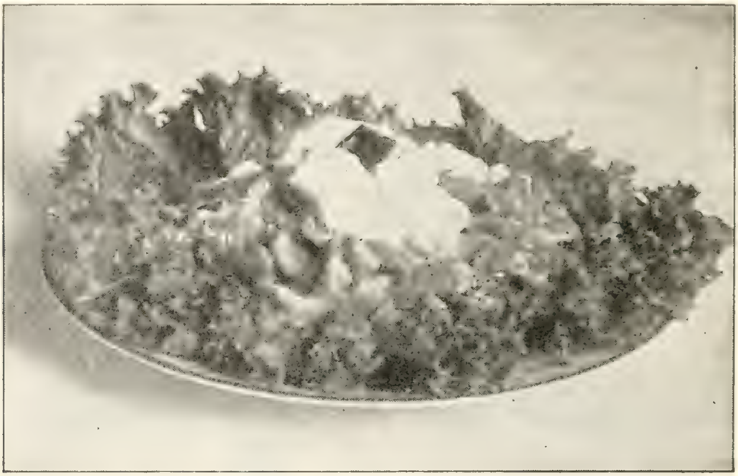

FIG. 36.— *Lima bean salad*

String bean salad

1 pint cold cooked string beans
1 medium-sized carrot, cooked and cut in dice
1 small onion, minced
Yolk of 1 hard-cooked egg
Salt and paprika

Mix the ingredients with boiled salad dressing, and use egg rings as a garnish.

Jellied beans

1 pint tomato juice
2 tablespoonfuls gelatine
⅓ cupful cold water
Salt and paprika
1 tablespoonful finely minced onion
1 bay leaf
1 cupful cold cooked string beans

Make a plain tomato jelly by dissolving the gelatine in the cold water and pouring over this the hot tomato juice, in which the seasoning ingredients have been cooked. Add to this mixture one cupful of cold string beans cut in small pieces. Pour the mixture into molds and allow it to chill. Serve with either boiled or oil dressing.

String bean soup

- $1\frac{1}{2}$ cupfuls cooked string beans, finely cut
- 1 pint beef stock
- 1 cupful tomato juice
- 1 small green pepper, minced
- 1 tablespoonful onion, minced

Combine the ingredients; simmer the mixture for ten or fifteen minutes. Serve this soup with slices of hard-cooked egg as a garnish.

FIG. 37.— *String bean salad*

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SUPPLEMENT TO

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

VOL. IV. No. 89 | JUNE 1, 1915 | FOOD SERIES No. 16

BEANS AND SIMILAR VEGETABLES AS FOOD

DISCUSSION PAPER

The desirability of using legumes as food and the large quantities in which they are grown in New York State have led to the publishing of this lesson. The staff of the Department of Home Economics is aided in its work by questions and suggestions based on your experience. The discussion papers offer opportunity for keeping in touch with you. By answering the following questions and returning the discussion paper to the Supervisors of the Cornell Reading Course for the Farm Home, you will indicate your interest.

1. What success have you had in canning peas and beans? What method have you used?

2. How many quarts of peas and beans did you can last year?

3. What varieties of peas and beans have you found to be good for cooking fresh and for canning?

4. Has it been customary in your household to use dried legumes as a substitute in part for meat?

5. Have you ever used dried cowpeas or soy beans as food?

6. Have you any good recipes to offer for the cooking of legumes?

Name...

Address...

Date...

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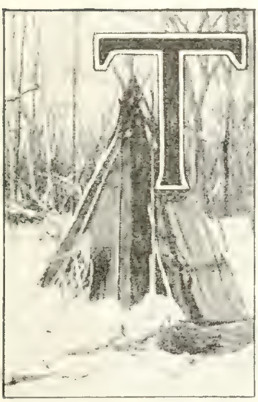
VOL. IV. No. 91 | JULY 1, 1915 | RURAL LIFE SERIES No. 11

THE LIFE OF PRIMITIVE WOMAN

BLANCHE EVANS HAZARD



TO know how the Eskimo mother keeps house, feeds and clothes her husband and children, teaches her daughters to cook and to dress skins, would be a source of interesting study for any woman in New York, and such knowledge would seem like a veritable treasure-trove to her boy and his comrades. In a small community a boy whose mother knows so much about Indians that she can actually help him "play Indian," is one to be envied by his playmates.

Yet to the civilized woman of to-day, the daily life of the uncivilized or primitive woman of the past or present time is a matter of indifference. She tolerates rather than understands her boy's delight in all things connected with Indians and Eskimos, and is glad that he is not the Fiji Islander he aspires to be. When she has bought him an Indian play-suit, a feathered headdress, and a bow and arrow, she dismisses all thought of primitive boys or men, girls or women. Yet few efforts on her part to please that boy could be productive of more enjoyment to him or of more interest to herself, than the telling of good stories about Eskimo or other primitive boys and their mothers.

It is not for their children alone, however, that the mothers in farm-houses all over this State are urged to inform themselves as to the life and the achievements of primitive women of all countries and centuries. It is as a citizen and as a probable future voter that she may well take an interest, based on knowledge, in the women of the Indian reservations, which are scattered over the State from Cattaraugus to St. Regis. What are the rights, the hopes, the abilities of these Indian women? What can the New York farmer's wife give to this Indian sister, and what can she receive from her? Will she be ready to welcome the successful

Indian artist, or craftsman, or farmer, who settles in her midst? Will she be willing to aid actively in securing for the Indians on the reservations the best and fairest means of civilization and its benefits?

These are real questions for New York women in clubs, reading circles, and homes to discuss and then decide intelligently. A winter's study of primitive women, including the Eskimo of the Northeast, the Alaskan of the Northwest, the women of the Pueblo regions of the Southwest, and the Filipinas across the Pacific, will help to make the New York woman ready for such discussion and decision. She will find her interest widening beyond the Indian women of her State and reaching all the primitive women and their families who are wards of this nation. What the citizens of the United States are to do with the Filipinos is a live question to American statesmen. While the men are thinking about giving the vote to the men of the Philippines, it will be a good thing to have the women thinking about the women and children of those islands. What will be best for them — more or less of American ways and education, more or less of American law and government? Shall they leave their old crafts, and make with their skillful fingers only the things Americans and Europeans want them to produce? Or shall American and European women learn to appreciate and to use the time-honored crafts and designs of these Filipino women just as they have come gradually to prize the Navajo rugs and the baskets from the Hupas of California? From these primitive peoples Americans should want to get the best their inheritance can furnish. Their case is akin to that of the European emigrants to this land.

"In Old Nuremburg one day a famous wood carver, fashioning the wooden draperies of a statue, whereof the delicate work betokened a lifetime of artisanship, paused to say to one who watched him, 'You are from America. I have a son in America. He is working in a furniture factory, fitting the arms upon chairs. He is not happy in that new land fitting arms to chairs, because he is the son and the grandson and the great grandson of wood carvers in Old Nuremburg.' The old German's words raise the query 'Is the United States making the most out of its immigrants?' In these times of specialists and machine-made articles, in a period when the immigrant is so rapidly formed into a mere cog in the wheel of vast industrial enterprises, is it not often forgotten that some of these men at least are offering to the western world the heritage of great talent which is slowly being crushed beneath the wheels of a materialistic Juggernaut?" [1]

The civilized woman of Europe needs to join her American sister in an interest in the welfare of primitive women and in seeking for knowledge of their physical, intellectual, and spiritual development, which has come

[1] Quoted from the *Christian Science Monitor* for April 6, 1915.

through their own efforts and through contact with the civilized people who have entered their midst. These women and their children are the wards of the more highly developed world races, whether the husbands and the fathers are uncivilized men of their own race, or white men from Europe and America. Which of their many myths and legends, games and amusements, shall Americans encourage and perpetuate? Americans have already taken "Brer Rabbit" from African negroes, and lacrosse from the Indians of the western plains. Shall they hope and help to educate primitive peoples, keeping the best and worthiest results these peoples have attained while they add the finest of their own? Or, are they to keep on giving only the white man's fire-water to make the Indians drunk, teaching deceit in trade and selfishness to the islanders of the Pacific at the same time they take the Christian faith and ideals to them?

All American women, whether in cities or in the country, ought to know and care about their primitive sisters. There are persons who have traveled among them with seeing, sympathetic eyes, and have put their stories in print. There are books to read that will make a woman quickly and surely know and care about the daily life of primitive woman and all her problems and achievements. Certain phases of her life, certain duties and privileges, can be taken for each program of the club for a series of eighteen meetings. Programs that have been used by some of the Cornell study clubs last winter, are given here for future use in scores of other clubs, with the encouraging assurance that they have already proved practicable as well as stimulating to many women in this State.

PROGRAMS AND STUDY TOPICS FOR CLUB MEETINGS

On the following pages are given programs for each of the eighteen meetings to be devoted to the study of primitive woman. Since fewer topics can be treated in any one meeting than will serve to give each club member a satisfactory view of the main topic for that day, a carefully selected list of study topics is given for each member to use in her own preparation, in order that she may be ready to appreciate the papers and to join in the general discussion.

The titles and authors of books with definite references are printed on pages 1674 to 1692 of this lesson, following a discussion of libraries and special collections of books that are available in the State of New York for the study of primitive woman.

The club members who are responsible for papers on programs should be notified in writing by the secretary or the chairman of the program committee at least two months ahead. A leader should always be chosen beforehand for the general discussion that is arranged for a program.

PROGRAM 1
INTRODUCTION TO PRIMITIVE WOMAN AND HER DAILY LIFE

Roll call.— Members should respond by giving the name of some primitive people or race living anywhere in the world to-day.

Paper.— Does civilized woman owe anything to primitive woman as her neighbor and as her nation's ward?

General discussion.

Paper.— Illustrated talk on the stone and bone implements with which primitive woman has had to do all her housework, that is, cooking, weaving, skin dressing, basket and pottery making. Pictures of some of these tools drawn on a large scale on a blackboard or big sheets of paper will help the speaker to hold the attention of her audience.

STUDY TOPICS FOR PROGRAM 1

Interest to be derived

1. From considering the primitive woman of to-day as the neighbor and the ward of the civilized woman.
2. From realizing and appreciating her skill.
3. From estimating her contributions to the arts and crafts of present civilized peoples.
4. From following sympathetically not only her material but her intellectual and spiritual development.
5. From a careful consideration of her gains and losses by voluntary or compulsory contact with civilization.

Study of details of stone and bone tools, which primitive woman has used. Note the material, the shape, the size, and the hafting of each tool, and consider the handicap each presented to the worker.

PROGRAM 2
PRIMITIVE WOMAN AS FOOD BRINGER

Roll call.— Members should respond by giving the name of a vegetable or a meat and one way it may be cooked.

FIG. 38.— *Beginning at the left: a rough stone ax from Arizona; a Mexican grinding stone for making meal; a less primitive scraper made of steel fastened with thongs to a deer's leg bone; a mortar and pestle from lower California; a stone ax from the country of the Shenandoahs in Virginia; a scoop made of musk ox horn from Alaska*

Paper.— How primitive woman cured, preserved, and stored meat and fish.

Paper.— Primitive ways of planting and cooking grains and vegetables.

Reading.— Kipling's *The Cat That Walked by Himself* in *Just So Stories.*

Paper.— Humorous and realistic story of primitive woman's escape from death by poison while she tasted and experimented on foods for her family.

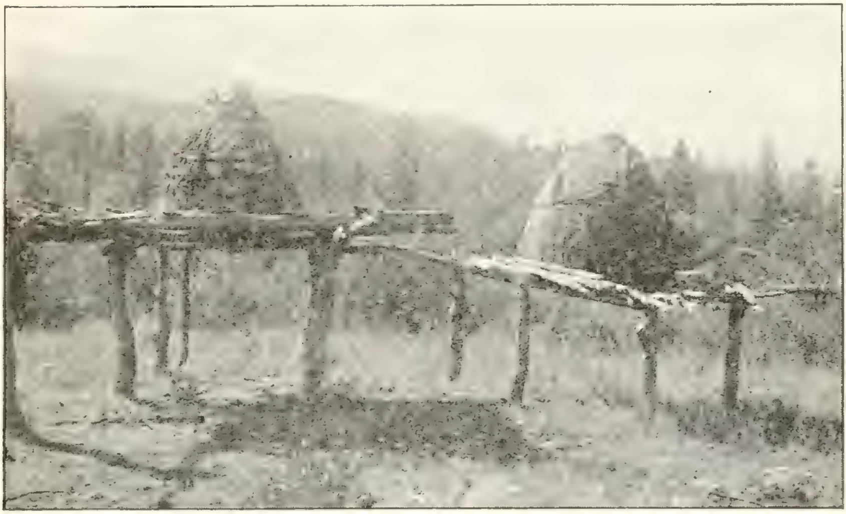


FIG. 39.— *Indian caches for storing acorns used for food in California*

STUDY TOPICS FOR PROGRAM 2

Finding, preserving, storing such foods as grain, roots, meats, and fruits.

Struggles of primitive woman to discover food in the "three kingdoms."

Appetites and needs of the primitive family considered and met, with no aid from books or recipes except traditions. Rule and process was to taste and find out what was satisfying, nutritious, and non-poisonous.

Discoveries made from results of the planting of seeds by winds and birds led to cultivation of grains with better harvest.

Invention of implements, such as stone hoes, knives, mortars, and pestles, for use in producing and preparing foodstuffs.

Invention and need of granaries. Use of baskets for picking, drying, sifting, and storing berries and grains.

Skin cases for pemmican, which is the primitive woman's sausage or canned meat in all cold countries.

Domestication of animals — goats for milk, cats to guard granaries, horses to help in transportation.

Drinks; their discovery, preparation, and effects.

PROGRAM 3

PRIMITIVE WOMAN AS COOK

Roll call.— Members should respond by giving the name of a kitchen utensil that is now considered absolutely necessary in the preparation of meals, and that they are sure a primitive woman did not have.

Paper and discussion.— Relative success in boiling, roasting, and steaming meats and vegetables to-day.

Paper.— Description of ovens, pots, and kettles used by primitive woman all over the world.

Paper.— Discoveries of primitive woman in cooking, viewed from a modern scientific standpoint.

STUDY TOPICS FOR PROGRAM 3

Cooking and serving grains, roots, meats.

Methods of cooking: boiling, roasting, steaming.

Ovens and the primitive fireless cooker.

Pots and kettles.

Experiments with tough vegetables and meats, made tender by cooking; with roots and fruits that can be made to lose poisons and acids by cooking.

FIG. 40.— *The work of American Indians of the Southwest. The basket on the extreme left is from California, all the others are from Arizona and New Mexico. The bottle-shaped one is a water container, being made water-tight by smears of pitch. The large flat one is a winnowing basket for tossing threshed grain into the air so that the wind will blow the chaff away as the grain falls*

Yeast for bread.

Summary.— The discoveries and inventions of primitive woman reviewed from a modern, scientific point of view.

FIG. 41.— *Navajo weavers*

PROGRAM 4

PRIMITIVE WOMAN AS BASKET MAKER

Roll call.— Each member should respond by naming a use for a basket among civilized peoples to-day.

Paper.— Material, shapes, sizes, and uses of baskets made by primitive woman.

Paper.— Experiences, difficulties, and triumphs of a modern basket maker.

Study and discussion.— Baskets made by civilized and by uncivilized women.

STUDY TOPICS FOR PROGRAM 4

Need of baskets

1. For storing and carrying grain and dried fruit.
2. For carrying water.

Invention of baskets; whence came the idea? Can it be traced to the use of gourds and shells?

Methods of making baskets: (1) coiled; (2) woven.

Shapes and designs of baskets.

Colors, natural juices and pigments, used for dyeing baskets.

Materials used, such as palm leaf, cedar bark, twigs of elm, osier, and willow, rattan, reeds, hard woods, splints, yucca fiber.

Mud-lined and mud-coated baskets, the forerunners of pottery.

PROGRAM 5

PRIMITIVE WOMAN AS WEAVER

Roll call.— Members should respond by giving rapidly names of different fabrics used by modern civilized women.

Paper.— Primitive woman's supply of materials and colors for cloth.

Forum. — Members should show (for five minutes) bits of cloth woven in their own families between 1750 and 1850.

Paper.— Description of the essential parts of all looms and the essential processes for weaving of any kind or any time. Simple illustrations, such as are found in Woolman and McGowan's *Textiles*, should be drawn on the blackboard to illustrate this topic.

STUDY TOPICS FOR PROGRAM 5

Need of clothing for warmth, ornament, or protection.

Sources of the present knowledge of primitive weaving.

Patterns and designs found now on prehistoric pottery.

Grave wrappings, for example, in Egypt and Peru.

Heirlooms among primitive people.

Survivals of ways of weaving among Navajos and Filipinos.

Material:

1. Qualities and quantities provided by nature.
2. Differences and difficulties in use.
3. Cotton and flax, rabbits' hair, palm leaf fiber, stripped bird and rabbit skin, goats' hair, cedar bark.

Spinning: forms and uses of spindles; skill required; position of spinners.

Weaving; forms and uses of looms.

1. Parts of looms: frame, treadle, shutter, batten.
2. Processes: shedding, picking, battening.

Colors of fabrics:

1. Natural colors.
2. Use of vegetable and mineral dyes.
3. Use of applied pigments.

Fashions and patterns of clothes made of woven materials.

PROGRAM 6

PRIMITIVE WOMAN AS SKIN DRESSER

Roll call.— Each member should respond by naming an article made nowadays of leather or fur.

Paper.— Skin dressing by the primitive hunter's wife. Processes described and explained.

Paper.—Fur clothes for the hunter's children. Patterns, needles, and sinews for making such clothes for Eskimo children. The Department of Home Economics has a set of slides to illustrate this topic. They can be borrowed by a Cornell study club if request is made to the Department of Home Economics.

STUDY TOPICS FOR PROGRAM 6

The naturalness of using the skins of animals for clothes in cold countries.

Processes and skill required for curing skins in order to make leather and fur.

Knives of stone, thread of sinew, needles of bone, for cutting and sewing fur.

Use of leather for tents, parfleche cases, harnesses, and furniture.

Visualization of the duties of the hunter's wife from the time the game is shot until the skin is made into garments for the household.

PROGRAM 7

PRIMITIVE WOMAN AS POTTER AND DISH MAKER

Roll call.— Members should respond by giving the name and the material of a dish for cooking or serving food that they consider necessary for comfortable and efficient housekeeping.

Paper.—The materials and processes necessary for making dishes and jars used by primitive women.

Demonstration.— Shapes, colors, and designs that have appeared in the pottery made by primitive women. The leader would do well to make colored charts, copying and enlarging colored plates given in reference books.

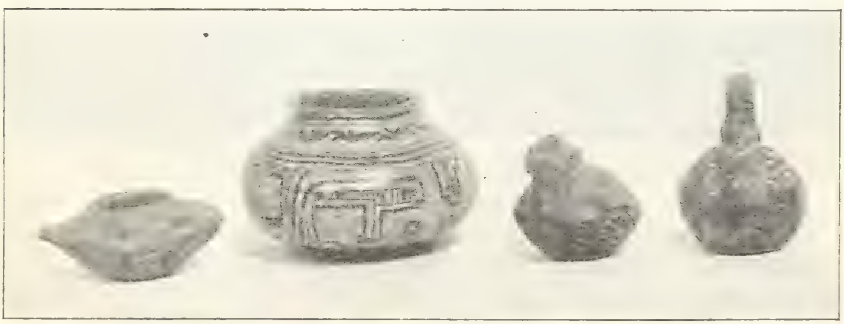


FIG. 42.— *Pottery made by women of American Indian tribes. The two pieces on the right are from Peru*

STUDY TOPICS FOR PROGRAM 7

Transition from clay-coated and clay-lined baskets to pottery jars and dishes.

Summary of experiences that have determined shapes and patterns of pottery, such as handles, legs, lips, necks, and the like.

Processes in making pottery:

1. Moulding from lumps.
2. Building by coils.

Miniature animal-shaped dishes for children's use.

Sources of information concerning primitive pottery:

1. Survivals in burial mounds and ruins.
2. Pictures on walls of tombs and caves.
3. Present day repetitions.

FIG. 43.—*A birch bark wigwam of the present day on a Wisconsin Indian reservation*

PROGRAM 8

PRIMITIVE WOMAN AS ARTIST

Roll call.— In place of the roll call it would be well to have three children of ages from ten to twelve speak parts of Longfellow's *Hiawatha.*

General discussion.— Ideas of beauty held and expressed by primitive woman:

1. Ideas that civilized woman of to-day admires, for example, in Pueblo pottery, Navajo rugs, and Chilcat blankets.
2. Ideas that civilized woman of to-day discards or scorns, for example, nose rings and tattooing.

The leader chosen for this discussion should organize her subject matter well and have at least five members prepared to speak for two minutes in order to make the discussion lively from the start.

Songs.—A group of Indian songs. MacDowell's *To a Water Lily* and Cadman's *Land of the Sky Blue Water* are particularly appropriate songs for this meeting and could be delightfully combined with a group of three native Indian songs.

Paper.—Nature as the primitive woman's art teacher in form and color.

STUDY TOPICS FOR PROGRAM 8

Crafts and customs in which primitive woman shows artistic desires and ability:

1. In weaving baskets and fabrics.
2. In pottery; form, color, design.
3. In clothing.
4. In furnishing and decorating tents or other shelter.
5. In personal adornment of hair, skin, lips, ears, teeth, ankles, and arms.
6. In music.
7. In story-telling.
8. In religious rites.

FIG. 44.— *The tepee of an Indian family in Idaho*

PROGRAM 9
PRIMITIVE WOMAN AS HOUSEBUILDER

Roll call.— Each member should read and then give to her right-hand neighbor a simple question on any topic that puzzles her in the first eight programs. This neighbor should bring a written answer to the question to the next meeting.

Paper.— Descriptions of different kinds of shelter used by primitive women in America, such as the snow igloo, the bark house, the skin tent, and the pueblo. Illustrations and ground plans drawn either on the blackboard or on large sheets of paper should be used to illustrate this paper.

Paper.— Furniture in primitive houses.

FIG. 45.— *Statue of Sacajawea, who guided Lewis and Clark on their expedition to the Northwest*

STUDY TOPICS FOR PROGRAM 9

Determining factors in the shelter of primitive people:

1. Natural conditions and resources; that is, climate, supply of wood, snow, skins, and granite.
2. Race habits; that is, whether the peoples are sedentary or nomadic.

Ground plans and illustrations for the kinds of shelter made by primitive peoples in America, Africa, and the Philippines.

Necessary furniture; details of pattern, material, and arrangement.

Accommodations for the children of the primitive family.

PROGRAM 10
PRIMITIVE WOMAN AS HOME MAKER

Roll call.—Members should respond by mentioning one duty of any woman as home maker in her efforts to secure the well-being of her family.

Paper.—A brief summary of a primitive woman's duties and privileges in securing creature comforts for her family through cooking, planting, storing, spinning, weaving, skin dressing, basket and pottery making, with the aid of her children.

Paper.— The education of the Indian girl in arts and crafts by her mother.

Discussion.— Why civilized woman ought to respect primitive woman as a housekeeper and a home maker.

Paper.—Modern Indian homes on Indian reservations in the State of New York. This paper should be given by a member who has seen these homes.

STUDY TOPICS FOR PROGRAM 10

Each member should review all the topics of the earlier programs from the point of view of primitive woman as a home maker and see to it that she grasps the significance of each phase of primitive woman's daily work, whether it be cooking or planting, building or weaving, and that she visualizes the processes. This program should round out the previous study of primitive woman's daily life and achievements. It should also suggest her possibilities and duties as a mother, as well as a housekeeper, and as a counsellor and guide for her children. In giving this program in Cortland County in the spring of 1915, the leader emphasized the primitive mothers' intimate care and teaching of the daughters who were just coming into womanhood and wifehood, with the suggestion of the lessons civilized mothers might take from primitive women in this respect.

FIG. 46.—*Sioux mother and child. The back as a baby carriage*

So far, the club members have followed primitive woman in the work of her hands for the material welfare of her family. This and later programs will follow her into the more intellectual and spiritual phases of her life and work.

PROGRAM 11

PRIMITIVE WOMAN AS BEAST OF BURDEN

Roll call.— Each member should respond by mentioning and illustrating by silent gestures one way employed by housekeepers to-day in lifting their burdens: for example, a tub of water, a basket of eggs, a baby, or a bolster.

Paper.— Baskets and packs for burdens of babies and baggage.

Paper.— Sleds and kaiaks used by the Eskimos.

Paper.— Modern survivals in Europe, Asia, and Africa of primitive methods and means of transportation.

STUDY TOPICS FOR PROGRAM 11

Animals and forces of nature as teachers of primitive woman in solving the problems of transportation.

FIG. 47.— *With the Cocopas, mother's hip is baby's saddle*

Agencies and devices for conveyance of persons:

1. Back, shoulders, hips, for babies.
2. Boats and sleds.

Agencies and devices for the freighting of baggage:

1. Poles, yokes, headrings.
2. Forehead and back straps.
3. Trays and suspended shelves.
4. Back, knees, hips, arms.
5. Trailing poles.

PROGRAM 12

PRIMITIVE WOMAN AS LINGUIST, STORY-TELLER, AND MYTH MAKER

Roll call.— Each member should respond by giving one verb or noun that came from a woman's daily occupation: for example, sew, cook, jar.

Paper.— Brief, interesting report on some of the nature myths of the Greeks and Romans.

Paper.— Explain the need and the growth of language in the home life of primitive woman.

Reading.— Kipling's *How the Alphabet Was Made* or *How the First Letter Was Written.*

STUDY TOPICS FOR PROGRAM 12

Memories of primitive women trained by the need and the custom of carrying traditions, myths, and legends.

Woman's part in the invention and the development of speech.

Picture writing on tents and cliffs.

The beautiful word-picturing in myths should be noted, and the characteristic religious myths of the Iroquois Indians should be studied for both content and expression.

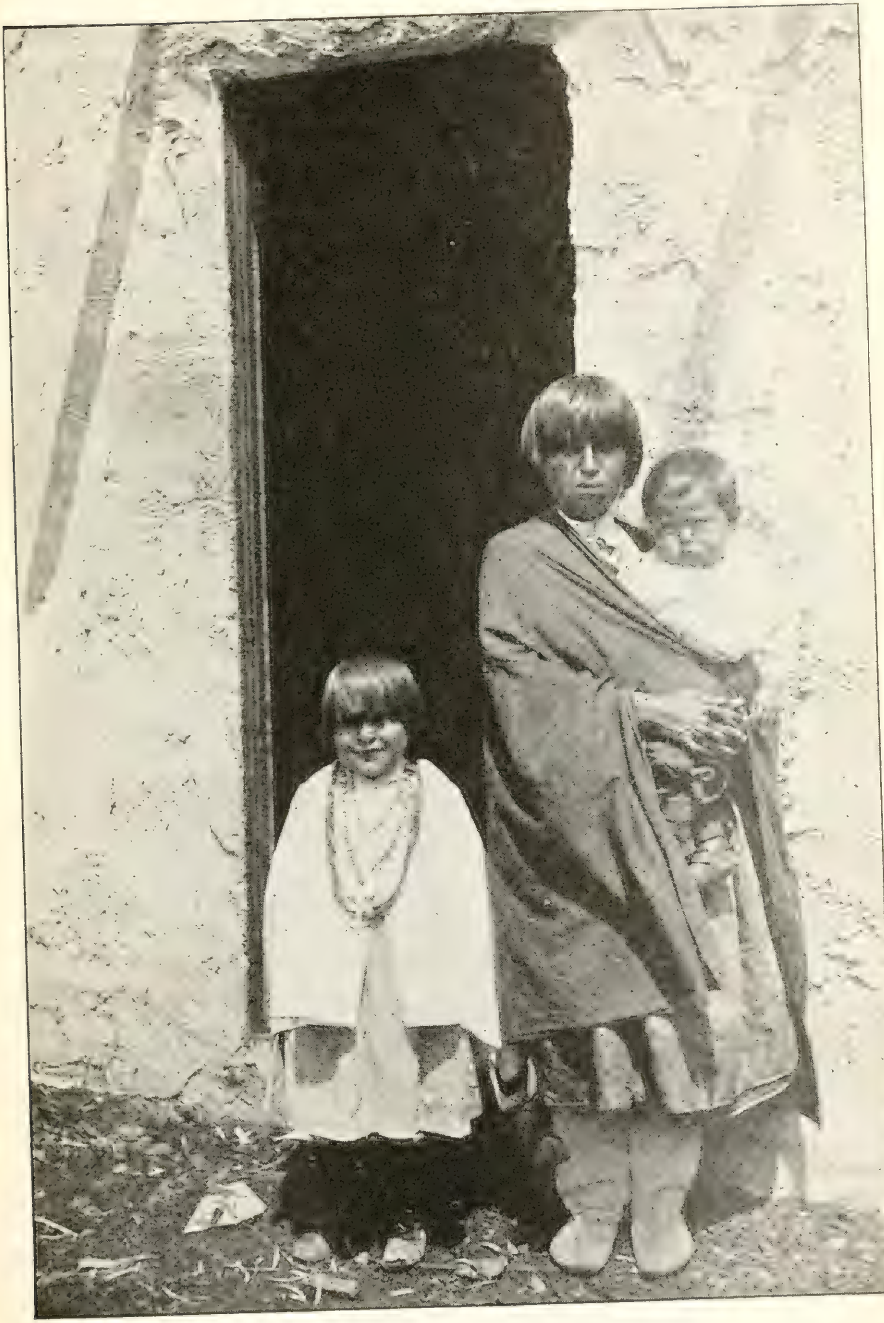


FIG. 48.— *A Moki Indian mother*

The growth of language should be traced, its modifications, its use in song and story among primitive peoples in Africa, Europe, and America.

African myths about "Brer Rabbit" should be followed to the plantations in the South.

PROGRAM 13

PRIMITIVE WOMAN AS FOUNDER OF SOCIETY

Roll call.— As a substitute for roll call one member might read the lines from Matthew Arnold's *Sohrab and Rustam* that tell of the love-making of Sohrab and his oriental bride and of the birth and the care of the baby Rustam.

Paper.— Primitive woman as wife, mother, and widow.

General discussion.— Is there romantic love among primitive people?

Paper.— A summary of the political, social, maternal, civil, and religious rights of the Iroquois women of New York in olden times.

Paper.— Contrast the early Iroquois woman's rights with those of the white woman of New York State to-day. (A study in woman's suffrage.)

STUDY TOPICS FOR PROGRAM 13

The clan system among primitive peoples.

Birth of a child in savagery.

Training of the primitive girl and maiden.

Is there romantic love among primitive people?

Marriage customs and forms; polyandry.

Descent in female line; in male line.

Divorce among savages and barbarians.

Provisions for widows and children.

Abstinence and morality among primitive women.

Courage and adaptability among primitive women.

Summary of the political, social, maternal, civil, and religious rights of the Iroquois woman.

Primitive women in councils and in battle.

PROGRAM 14

THE AMUSEMENTS OF PRIMITIVE WOMAN AND HER FAMILY[2]

(An evening meeting for the club members and their families)

Roll call.— Each member should respond by reporting a game that she and some of her family will play, or by giving the name of a toy made after the pattern of some primitive toy.

Games.— Games of primitive boys and girls. These should be enacted by children of members of the club.

Games.— Games of primitive men and women. These should be played by club members and their husbands.

[2] Substitutes for these games and papers can be found in the moving picture film entitled *The Chevalier's Return.* It shows a group of Iroquois Indians at play. This film is owned and will be lent on application by the New York State College of Agriculture to any club that has the proper apparatus for using it.

Paper.— Eskimo, Hopi, and Iroquois dolls. It would be interesting to have a group of small children playing with toys like those of Indian and Eskimo children.

Paper.— Pipes and smoking among primitive men and women.

STUDY TOPICS FOR PROGRAM 14

The common human need of amusements; therefore, games of chance and dexterity for grown-ups, and toys for small children.

Three classes of toys:

1. For attracting, soothing, and amusing infants: for example, rattles.
2. Those invented or appropriated by children for their own use: for example, bits of wood, rags, and the like, idealized by imagination.
3. Those supplied by adults from religious, educational, or æsthetic motives: for example, dolls, miniature implements, and dishes.

World-wide development of games:

1. Games of chance.
2. Games of dexterity.

Summary of modern games derived from those of primitive peoples: for example, lacrosse and jackstones.

FIG. 20.— *A corn-husk doll, such as Iroquois children have always enjoyed. This was made by an Iroquois woman*

PROGRAM 15

PRIMITIVE WOMAN AS PATRON OF RELIGION

Roll call.— Each member should name an object or a force in nature that might be feared and worshipped by primitive woman.

Paper.— Iroquois religious beliefs and the priestesses, or keepers of the faith.

Discussion.— Are primitive people at all religious in the modern sense?

Paper.— Religious dances and their meaning to primitive people. Survivals among the Hopi and the Iroquois. Parts of Roosevelt's article on this subject from *The Outlook*, October 18, 1913, and of Morgan's *League of the Ho-dé-no-sau-nee, or Iroquois*, should be read aloud.

STUDY TOPICS FOR PROGRAM 15

Definition of creed and cult.

Altars, totems, and symbols used in primitive religious ceremonies.

Common elements in religious beliefs and worship of all primitive peoples: that is, worship of sun, moon, stars, winds, thunder, and other forces of nature.

Personification of the elements of nature. Belief in their volition and their good or ill will; therefore practice of propitiation, which becomes worship.

Altars and votive offerings from flocks and herds, from gardens and hunt. Use of symbolic offerings, such as feathers and honey.

Creation and God myths of all times and peoples.

Religious festivals; rites, games, dances.

Detailed study of the Iroquois creed, cults, and customs. Religious societies and fraternities.

Beliefs and practices of medicine men.

PROGRAM 16

BURIAL CUSTOMS OF PRIMITIVE WOMAN

Roll call.— Each member should name one of the present day mourning customs practiced before or after funerals.

FIG. 50.— *An Indian grave of the present day in Minnesota*

Paper.— Descriptions of different kinds of burials.

Paper.— Duties, privileges, appearance, and probable future of primitive woman in her widowhood.

General discussion.— What relics of barbarism in the mourning customs of to-day should be discarded or modified? What mourning customs might be adopted from primitive peoples?

STUDY TOPICS FOR PROGRAM 16

Disposition of the dead by (1) cremation or (2) burial.

Modes of burial: in urns; under floor of tent or hut; scaffold or aerial burial; aquatic burial; canoe burial; mound burial; cliff burial.

Care of dead body and preparation for burial; embalmment. Egyptian and Peruvian mummies should be compared.

Funeral ceremonies: songs, mourning feasts, dances.

Postfuneral care of the dead; food and offerings at the grave. Customs of the Greeks and the Romans should be compared with those of the American Indians.

Customs of mourners, especially the women.

" Burial of the name " of the dead — ceasing to use or mention it.

Significance of certain funeral customs with regard to:

1. The spirit of the deceased.
2. The surviving relatives and friends.

The willow token of the Omaha mourners. The tribal moccasin.

PROGRAM 17

EFFECTS OF CONTACT WITH THE CIVILIZATION OF WHITE MEN ON PRIMITIVE WOMAN

Roll call.— Members should respond by giving the name of any country where white men are trading with primitive men and women to-day.

Paper.— The effect of the tastes and the demands of civilized women as customers on primitive basketry, pottery, and weaving.

Paper.— The usual fate of the primitive woman as the wife of a white man and as the mother of half-breed children. *Glory of the Morning* by Leonard should be read aloud.

Discussion.— Should intermarriage of primitive woman and civilized white man be encouraged or discouraged, and under what conditions as to the care and the education of the children born to the uncivilized mother?

STUDY TOPICS FOR PROGRAM 17

Primitive woman's relations with the white man coming from Europe and America: (1) as trader; (2) as husband; (3) as father of her children.

Gradual change in the character of design and skill used in making commercial pottery, basketry, and weaving. Assumption of these crafts by men for commercial supplies.

General adoption by primitive woman of red flannel, glass beads, clothing, pots, pans, and kettles, manufactured and sold by civilized man.

Conditions and results of intermarriage. Is this intermarriage good for the world?

Care and future prospects of half-breed children.

PROGRAM 18

SUMMARY AND CONCLUSION. FUTURE RELATIONS OF PRIMITIVE AND CIVILIZED WOMEN

Roll call.— Each member should respond by mentioning one gift or inheritance from primitive woman: for example, the use of yeast, coiled basketry, nature myths, and the like.

Paper.— Civilized man's inheritance from primitive woman.

Paper.— The Indian agency system. Is it valuable, and is it fair?

Paper.—Civilized woman's responsibilities toward the primitive woman of to-day.

General discussion.— Is it fair to unsettle or to destroy creeds, customs, and crafts of primitive woman and her children without giving them something definite and better in their place?

STUDY TOPICS FOR PROGRAM 18

Review all arts and crafts, creeds and customs, of the primitive women of all times that have led to something that is cherished or depended on to-day.

Indian good faith to clan, guest, and friend.

Is not primitive woman the neighbor, in the Bible sense, of all civilized women to-day?

If Indians in America, Negroes in Africa, Bushmen in Australia, have been driven from their old hunting grounds and fishing stations to make room for farms and city lots for civilized men, do the latter owe them the education and the sympathy that will fit them for the new sort of existence?

Should world's fairs and circuses present false ideas of the real or the would-be life of uncivilized peoples?

REFERENCES FOR THE STUDY OF THE LIFE OF PRIMITIVE WOMAN

For all club members:

When the call came last winter from some of the Cornell study clubs for programs, study topics, and references to aid in the study of primitive woman's life and achievements, it seemed likely that other clubs might join in this work another year, and accordingly the programs were carefully made to fit the needs and the library facilities of the average rural community in New York State. Knowing full well that some communities would be shut off by winter storms from towns where libraries could be used, one book was given as a steady source, *Woman's Share in Primitive Culture*, by Otis Tufton Mason. It is hoped and advised that at least one copy of this textbook will be bought and used in common by the members of each club.[3] It can be kept at a central place or at the club secretary's house if that is centrally located. This book should be placed where it will be accessible at all times to any member, who in turn should be held to definite rules regarding the time for holding and returning it. This one book, *Woman's Share in Primitive Culture*, can in and of itself supply enough material to stimulate interest and to answer questions on nearly all the topics suggested. It can be most advantageously supplemented, however, by the *Handbook of American Indians North of Mexico*, issued in two large volumes by the American Bureau of Ethnology as Bulletin 30. This handbook is a veritable treasure bag, full of just the pieces of information that not only the mother but the boys and girls of the family can use with profit and enjoyment. These volumes are arranged alphabetically and are very fully illustrated. The articles are written by specialists on each subject, and they represent the latest information from research and observation. These books would make a valuable addition to the grammar school library of the village when the club members have finished their studies in them.

[3] *Woman's Share in Primitive Culture*, published by D. Appleton and Company. Cornell study club members can buy this book at a discount by ordering it through the club secretary.

As a supplement to these principal sources of information on primitive woman that can be available for each study club, there may be found material in books on travel in Africa, Labrador, and South America in the public library of the village or on private bookshelves. If any one in the community is taking *The National Geographic Magazine* and has by happy chance a file of back numbers, she should be courted by others and made enthusiastic enough to use them to advantage for the interest and the information of the whole study club.

There are, besides, two small, inexpensive books written and published by the curators of ethnology at the New York Museum of Natural History in New York City. These books are well illustrated, carefully indexed, and can be ordered and delivered by mail. To both of them, Wissler's *North American Indians of the Plains* and Goddard's *Indians of the Southwest*, references have been made throughout these lists. The ethnological department at Albany has issued several bulletins on Indian affairs, which can be bought from the department or borrowed from the State Library at Albany. To these, frequent references have been given.

This leads to the question of how far the traveling libraries can be made available to meet the needs of study classes at work on the primitive woman course. The State Library authorities at Albany will send on application books of travel and some United States Government documents, such as the annual reports of the Smithsonian Institution and the reports of the Bureau of Ethnology, in so far as they can make their supply meet demands. In Cortland County, for example, where over a dozen clubs have been eager for the same books for working up these programs, a set of books has been furnished by the Albany library on condition of its being kept together in the farm bureau office in Cortland, the most central and the largest town in the group. Because such wonderfully interesting and valuable accounts are given and fully illustrated in these reports, references are given to them under each program, so that special papers suggested in the outlines can be prepared by those members who can obtain the use of these reports. There is opportunity for choice among the numerous references given under each program. If one of the club members happens to be in a city, such as Buffalo, Rochester, Syracuse, or Utica, where she could use the books in the public library, she could go with speed and surety to the very volume and page cited in the reference lists. The list, then, is longer than any one club or club member needs to use, and it is graded as to the probabilities of securing the books. It need not discourage any one, but rather it should offer to each woman who owns this reading course lesson a stimulating sense of further possibilities during a lifetime for finding out more about a subject in which she has become interested.

The references for each program are divided into two groups. The first group is to books suggested as texts; the second group, arranged alphabetically, is to books recommended for wider reading on special topics.

REFERENCES FOR PROGRAM I

INTRODUCTION TO PRIMITIVE WOMAN AND HER DAILY LIFE

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter I.

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 50–55.

Wissler, Clark
1912 North American Indians of the plains, p. 23–28, 69–76.

Mason, Otis T.
1910 The origins of invention: a study of industry among primitive peoples. Chapters II and IV.

Wilson, Thomas
1897 Arrowpoints, spearheads, and knives of prehistoric times. U. S. National Museum. Report for 1897, p. 811–988.

GROUP II

Bernard, Kate
1914 Friend of friendless Indian children. The Quarterly Journal of the Society of American Indians, October–December, 1914, p. 312–314.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 601–603 (Implements, tools, utensils).

Kershaw, William J.
1914 The red man's appeal. The Quarterly Journal of the Society of American Indians, October–December, 1914, p. 275–276.

Parker, Arthur C.
1914 The awakened American Indians. The Quarterly Journal of the Society of American Indians, October–December, 1914, p. 269–274.

Frachtenberg, Leo J.
1914 Our indebtedness to the American Indian. The Quarterly Journal of the Society of American Indians, July–September, 1914, p. 197–202.

(Compilation)

Tenth report of the director of the state museum and science department. New York State Museum. Museum bulletin 173, p. 93–102, 143–156.

Worcester, Dean C.

1913 The non-Christian peoples of the Philippine Islands. The National Geographic Magazine, November, 1913.

REFERENCES FOR PROGRAM 2

PRIMITIVE WOMAN AS FOOD BRINGER

GROUP I

Mason, Otis T.

1907 Woman's share in primitive culture, Chapter II and p. 142–150.

1910 The origins of invention: a study of industry among primitive peoples. Chapters VI and VIII.

(Compilation)

Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 461–463 (Fishing), 466–469 (Food), 580–581 (Hunting), 790–791 (Maize).

Goddard, Pliny Earle

1913 Indians of the Southwest, p. 39–41, 79–85, 136–140.

Parker, Arthur C.

1910 Iroquois uses of maize and other food plants. New York State Museum. Museum bulletin 144, p. 9–45, 89–109.

Wissler, Clark

1912 North American Indians of the plains, p. 19–29.

GROUP II

Joyce, T. Athol, and Thomas, N. W., editors

1911 Women of all nations; a record of their characteristics, habits, manners, customs, and influence.

Kipling, Rudyard

1902 Just so stories. The cat that walked by himself.

Parker, K. Langloh

1905 The Euahlayi tribe: a study of aboriginal life in Australia. Chapter XIII.

Roscoe, John

1911 The Baganda; an account of their native customs and beliefs Chapters XIII and XIV.

Thomas, N. W.
1906 Natives of Australia, Chapter VI.

Weeks, John H.
1914 Among the primitive Bakongo, Chapter VIII.

Werner, A.
1906 The natives of British Central Africa, Chapters VI and VIII, p. 176–185.

REFERENCES FOR PROGRAM 3
PRIMITIVE WOMAN AS COOK

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter II.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 456 (Fermentation), 459–460 (Fire-making); part 2, p. 176–177 (Ovens), 295–299 (Pottery).

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 15, 33, 83–84, 136–140.

Parker, Arthur C.
1910 Iroquois uses of maize and other food plants. New York State Museum. Museum bulletin 144, p. 45–80.

Wissler, Clark
1912 North American Indians of the plains, p. 26–29, 51, 69–71, 72–75.

GROUP II

Parker, K. Langloh
1905 The Euahlayi tribe: a study of aboriginal life in Australia. Chapter XIII.

Roscoe, John
1911 The Baganda; an account of their native customs and beliefs. Chapter XIII.

Weeks, John H.
1914 Among the primitive Bakongo, Chapter VIII.

Werner, A.
1906 The natives of British Central Africa, Chapter VI.

REFERENCES FOR PROGRAM 4
PRIMITIVE WOMAN AS BASKET MAKER

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter III, p. 41–53.

(Compilation)

Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 97–99 (Arts and industries), 130–132 (Bark), 132–135 (Basketry); part 2, p. 643–644 (Storage and caching).

Goddard, Pliny Earle

1913 Indians of the Southwest, p. 45–48, 94–95.

Parker, Arthur C.

1910 Iroquois uses of maize and other food plants. New York State Museum. Museum bulletin 144.

GROUP II

James, George Wharton

1903 Indian basketry, and how to make Indian and other baskets.

Lane, Franklin K.

1915 From the war-path to the plow. The National Geographic Magazine, January, 1915, p. 81. (Illustration.)

Mason, Otis T.

1902 Aboriginal American basketry: studies in a textile art without machinery. U. S. National Museum. Report for 1902, p. 171–548 and plates 1–248.

Simpich, Frederick and Margaret

1914 Where Adam and Eve lived. The National Geographic Magazine, December, 1914, p. 555, 571. (Illustrations.)

Werner, A.

1906 The natives of British Central Africa, Chapter VIII.

REFERENCES FOR PROGRAM 5
PRIMITIVE WOMAN AS WEAVER

GROUP I

Mason, Otis T.

1907 Woman's share in primitive culture, Chapter III, p. 53–69.

(Compilation)

Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 310–313 (Clothing); part 2, p. 928–929 (Weaving).

Goddard, Pliny Earle

1913 Indians of the Southwest, p. 49–53.

Joyce, T. Athol, and Thomas, N. W., editors

1911 Women of all nations; a record of their characteristics, habits, manners, customs, and influence.

Wissler, Clark
1912 North American Indians of the plains, p. 52.

Woolman, Mary Schenck, and McGowan, Ellen Beers
1914 Textiles, Chapters I and III.

GROUP II

Holmes, W. H.
1881–82 Prehistoric textile fabrics of the United States, derived from impressions on pottery. Third annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1881–82, p. 397–425.

Mason, Otis T.
1910 The origins of invention: a study of industry among primitive peoples. Chapter VII.

Matthews, Washington
1881–82 Navajo weavers. Third annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1881–82, p. 371–391.

Parker, K. Langloh
1905 The Euahlayi tribe: a study of aboriginal life in Australia. Chapter XIV.

Werner, A.
1906 The natives of British Central Africa, p. 195–201.

REFERENCES FOR PROGRAM 6

PRIMITIVE WOMAN AS SKIN DRESSER

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter IV.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 2, p. 591–594 (Skin and skin dressing).

Wissler, Clark
1912 North American Indians of the plains, p. 41–50, 52–69.

GROUP II

Boaz, Frank
1884–85 The central Eskimo. Sixth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1884–85, p. 471–516.

Joyce, T. Athol, and Thomas, N. W., editors
1911 Women of all nations; a record of their characteristics, habits, manners, customs, and influence.

Murdoch, John
1887–88 Ethnological results of the Point Barrow expedition. Ninth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1887–88, p. 109–149.

Raphael, John R.
1914 Through unknown Nigeria, Chapter XIII.

Roscoe, John
1911 The Baganda; an account of their native customs and beliefs. Chapter XIV.

REFERENCES FOR PROGRAM 7

PRIMITIVE WOMAN AS POTTER AND DISH MAKER

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter V.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 94–96 (Art); part 2, p. 149–155 (Ornament), 295–299 (Pottery).

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 41, 43, 45, 90–93, 143–145.

Wissler, Clark
1912 North American Indians of the plains, p. 69–72.

GROUP II

Cushing, Frank H.
1882–83 A study of Pueblo pottery as illustrative of Zuni culture-growth. Fourth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1882–83, p. 473–521.

Holmes, William H.
1882–83 Origin and development of form and ornament in ceramic art. Ancient pottery of the Mississippi valley. Fourth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1882–83, p. 367–436, 443–465.

Joyce, T. Athol, and Thomas, N. W., editors
1911 Women of all nations; a record of their characteristics, habits, manners, customs, and influence.

Mason, Otis T.
1910 The origins of invention: a study of industry among primitive peoples. Chapter V.

Werner, A.
1906 The natives of British Central Africa, p. 204–206.

REFERENCES FOR PROGRAM 8
PRIMITIVE WOMAN AS ARTIST
GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter VIII.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 94–96 (Art), 958–961 (Music and musical instruments).

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 26, 41–42, 44–47, 49, 76, 91–93, 142, 145–146, 148–149, 150, 157, 159–160, 167–168, 171.

Wissler, Clark
1912 North American Indians of the plains, p. 41, 120–123, 124.

GROUP II

Boaz, Frank
1884 85 The central Eskimo. Sixth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1884–85, p. 648–658.

Hoffman, W. J.
1885–86 The midē′wiwin, or "grand medicine society," of the Ojibwa. Seventh annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1885–86, p. 207–208, 213–216.

Joyce, T. Athol, and Thomas, N. W., editors
1911 Women of all nations; a record of their characteristics, habits, manners, customs, and influence.

Talbot, P. Amaury
1912 In the shadow of the bush, Chapter XXVII.

Thomas, N. W.
1906 Natives of Australia, Chapters IV and V.

Wanneh, Gawasa
1914 Situwaka, chief of the Chilcats. The Quarterly Journal of the Society of American Indians, October-December, 1914, p. 280–283.

Werner, A.
1906 The natives of British Central Africa, Chapters V and IX.

REFERENCES FOR PROGRAM 9
PRIMITIVE WOMAN AS HOUSEBUILDER

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter VII, p. 152–154.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 476–479 (Furniture), 515–519 (Habitations).

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 74–79, 132–136.

Wissler, Clark
1912 North American Indians of the plains, p. 35–40.

GROUP II

Billings, L. G.
1915 Some personal experiences with earthquakes. The National Geographic Magazine, January, 1915, p. 61. (Illustration.)

Dorsey, James Owen
1891–92 Omaha dwellings, furniture, and implements. Thirteenth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1891–92, p. 269–278.

Lane, Franklin K.
1915 From the war-path to the plow. The National Geographic Magazine, January, 1915, p. 75–77. (Illustrations.)

Mason, Otis T.
1887 Cradles of the American aborigines. U. S. National Museum. Report for 1887, p. 161–212.

Murdoch, John
1887–88 Ethnological results of the Point Barrow expedition. Ninth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1887–88, p. 72–86, 109–149.

Raphael, John R.
1914 Through unknown Nigeria, Chapter XI.

Simpich, Frederick and Margaret
1914 Where Adam and Eve lived. The National Geographic Magazine, December, 1914, p. 575. (Illustration.)

Thomas, N. W.
1906 Natives of Australia, Chapter V.

Townley-Fullam, C.
1914 Hungary: a land of shepherd kings. The National Geographic Magazine, October, 1914, p. 322, 333, 337. (Illustrations.)

Werner, A.
1906 The natives of British Central Africa, Chapter VI.

REFERENCES FOR PROGRAM 10
PRIMITIVE WOMAN AS HOME MAKER

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter VII and review of Chapters I-VI.

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 88–89, 91–95, 133, 137, 152–153.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, parts 1 and 2. Review of previous references.

Wissler, Clark
1912 North American Indians of the plains, p. 86–88, 93–95.

GROUP II

Calkins, Franklin Welles
1902 Two wilderness voyagers: a true tale of Indian life.

Deming, Therese Osterheld
1899 Indian child life.
1902 Red folk and wild folk.

Hazard, Blanch Evans, and Dutton, Samuel T.
1913 Indians and pioneers, p. 60–63, 65–66, 76–78. Revised edition.

Lane, Franklin K.
1915 From the war-path to the plow. The National Geographic Magazine, January, 1915.

Longfellow, Henry Wadsworth
1855 Hiawatha.

Parsons, Elsie Clews
1906 The family.

Talbot, P. Amaury
1912 In the shadow of the bush, Chapters IX and X.

Thomas, William I.
1907 Sex and society.

True, John Preston
1899 The iron star, and what it saw on its journey through the ages.

Werner, A.
1906 The natives of British Central Africa, Chapters V and VI.

REFERENCES FOR PROGRAM 11
PRIMITIVE WOMAN AS BEAST OF BURDEN
GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter VI.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 156–157 (Boats), 330–332 (Commerce); part 2, p. 799–801 (Trails and trade routes), 802 (Travel).

Wissler, Clark
1912 North American Indians of the plains, p. 29–35.

GROUP II

Albrecht, Florence Craig
1915 The city of Jacqueline. The National Geographic Magazine, January, 1915, p. 36, 47. (Illustrations.)

Calkins, Franklin Welles
1902 Two wilderness voyagers: a true tale of Indian life.

Grosvenor, Gilbert H.
1914 Young Russia. The National Geographic Magazine, November, 1914, p. 479. (Illustration.)

Lane, Franklin K.
1915 From the war-path to the plow. The National Geographic Magazine, January, 1915, p. 85. (Illustration.)

Mason, Otis T.
1894 Primitive travel and transportation. U. S. National Museum. Report for 1894, p. 237–593.
1910 The origins of invention: a study of industry among primitive peoples. Chapter X.

Murdoch, John
1887–88 Ethnological results of the Point Barrow expedition. Ninth annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1887–88, p. 3–441.

Roscoe, John
1911 The Baganda; an account of their native customs and beliefs. Chapter XII.

Showalter, William Joseph
1915 Partitioned Poland. The National Geographic Magazine, January, 1915, p. 104. (Illustration.)

Townley-Fullam, C.
1914 Hungary: a land of shepherd kings. The National Geographic Magazine, October, 1914, p. 325, 360, 368. (Illustrations.)

REFERENCES FOR PROGRAM 12

PRIMITIVE WOMAN AS LINGUIST, STORY-TELLER, AND MYTH MAKER

GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter IX.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 757–759 (Languages), 964–972 (Mythology); part 2, p. 242–245 (Pictographs).

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 68, 70, 174, 178.

Wissler, Clark
1912 North American Indians of the plains, p. 97–100, 127–131, 139–140.

GROUP II

Bulfinch, Thomas
1868 The age of fable; or beauties of mythology.

Converse, Harriet Maxwell, and Parker, Arthur Caswell
1908 Myths and legends of the New York State Iroquois. New York State Museum. Museum bulletin 125.

Guerber, H. A.
1893 Myths of Greece and Rome.

Kidd, Dudley
1906 Savage childhood: a study of Kafir children. Chapter VII.

Kipling, Rudyard
1902 Just so stories. How the first letter was written.

Mooney, James
1897–98 Myths of the Cherokee. Nineteenth annual report of the Bureau of American Ethnology to the secretary of the Smithsonian Institution for 1897–98, part 1, p. 35–38.

Powell, J. W.
1879-80 Sketch of the mythology of the North American Indians. First annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1879–80, p. 17–56.

Skinner, Alanson B.
1915 The value of recording Indian folklore. The Quarterly Journal of the Society of American Indians, January–March, 1915, p. 46–48.

Smith, Erminnie A.
1880-81 Myths of the Iroquois. Second annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1880–81, p. 47–116.

Roscoe, John
1911 The Baganda; an account of their native customs and beliefs. Chapter XVII.

Talbot, P. Amaury
1912 In the shadow of the bush, Chapter XXXI.

Thomas, N. W.
1906 Natives of Australia, Chapter XV.

Werner, A.
1906 The natives of British Central Africa, Chapter X.

REFERENCES FOR PROGRAM 13
PRIMITIVE WOMAN AS FOUNDER OF SOCIETY
GROUP I

Mason, Otis T.
1907 Woman's share in primitive culture, Chapter X.

(Compilation)
Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 303–305 (Clan and gens); part 2, p. 608–612 (Social organization).

Goddard, Pliny Earle
1913 Indians of the Southwest, p. 97–107.

Wissler, Clark
1912 North American Indians of the plains, p. 86–87, 95–96.

GROUP II

Converse, Harriet Maxwell, and Parker, Arthur Caswell
1908 Myths and legends of the New York State Iroquois. New York State Museum. Museum bulletin 125, p. 135–138.

Dorsey, J. Owen

1881–82 Omaha sociology. Third annual report of the Bureau of Ethnology to the secretary of the Smithsonian Institution for 1881–82, p. 205–370.

Kidd, Dudley

1906 Savage childhood: a study of Kafir children. Chapter I.

Morgan, Lewis H.

1878 Ancient society.

1901 League of the Ho-de'-no-sau-nee, or Iroquois. (Edited by Herbert M. Lloyd.)

Parker, K. Langloh

1905 The Euahlayi tribe: a study of aboriginal life in Australia. Chapters VII and VIII.

Raphael, John R.

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1912 In the shadow of the bush, Chapters IX–XII.

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1914 Among the primitive Bakongo, Chapters V, IX, X, XI, and XIII.

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1913 The Hopi snake dance. The Outlook, October 18, 1913.

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Wissler, Clark
1912 North American Indians of the plains, p. 88.

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1905 The Euahlayi tribe: a study of aboriginal life in Australia. Chapter X.

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Handbook of American Indians north of Mexico. Smithsonian Institution, Bureau of American Ethnology. Bulletin 30, part 1, p. 850 (Métis), 913–914 (Mixed-bloods); part 2, p. 282–286 (Popular fallacies).

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1902 Audrey.

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1899 West African studies, Chapter XVI.

Leonard, William Ellery
1914 Glory of the Morning. *In* Wisconsin plays.

Murray, J. H. P.
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1914 The awakened American Indian. The Quarterly Journal of The Society of American Indians, October–December, 1914, p. 269–274.

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Eastman, Charles A.

1915 The Indian's gift to the nation. The Quarterly Journal of the Society of American Indians, January–March, 1915, p. 17–23.

Frachtenberg, Leo J.

1914 Our indebtedness to the American Indian. The Quarterly Journal of the Society of American Indians, July–September, 1914, p. 197–202.

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1899 West African studies, Chapter XVI.

Murray, J. H. P.

1912 Papua, or British New Guinea, Chapter XV.

Robe, Chauncey Yellow

1914 The menace of the wild west show. The Quarterly Journal of the Society of American Indians, July–September, 1914, p. 224–225.

Gohl, E. H.

1914 The effect of wild westing. The Quarterly Journal of the Society of American Indians, July–September, 1914, p. 226–228.

Some of the best books of travel and of description of primitive life are listed below as a guide to club members in their requests and search and also in future buying, when Christmas or their children's birthdays come.

A club secretary or a member can obtain from a book-store or a stationer the names of publishers and the prices of these books.

Starred titles designate books already owned by the State and sent out from Albany in the traveling libraries. Correspondence on this subject should be addressed to Division of Educational Extension, University of the State of New York, Albany, New York.

AUSTRALIA

Parker, K. Langloh

1905 The Euahlayi tribe: a study of aboriginal life in Australia.

Thomas, N. W.

1906 Natives of Australia. (One hundred and thirty-two full-page illustrations.)

AFRICA

*Johnston, Harry
1908 George Grenfell and the Congo. (In two volumes, with index and illustrations.)

*Kidd, Dudley
1906 Savage childhood: a study of Kafir children. (Thirty-two full-page illustrations.)

*Kingsley, Mary H.
1904 Travels in West Africa.

Raphael, John R.
1914 Through unknown Nigeria. (Illustrated.)

Roscoe, John
1911 The Baganda; an account of their native customs and beliefs.

Talbot, P. Amaury
1912 In the shadow of the bush.

Weeks, John H.
1914 Among the primitive Bakongo. (Forty illustrations and a map.)

Werner, A.
1906 The natives of British Central Africa.

Westermarck, Edward
1914 Marriage ceremonies in Morocco.

NEW GUINEA

Murray, J. H. P.
1912 Papua, or British New Guinea.

BOOKS FOR CHILDREN

Calkins, Franklin Welles
1902 Two wilderness voyagers: a true tale of Indian life. (Suitable for boys and girls from ten to fifteen years of age.)

*Deming, Theresa Osterheld
1899 Indian child life. (Illustrated in color by Edwin Willard Deming. Suitable for children from five to ten years of age.)

1902 Red folk and wild folk. (Illustrated in color by Edwin Willard Deming. Suitable for children from five to eight years of age.)

*Hazard, Blanche Evans, and Dutton, Samuel T.
1913 Indians and pioneers. (Illustrated in black and white. Suitable for children from eight to ten years of age.)

***True, John Preston**

1899 The iron star, and what it saw on its journey through the ages. (Illustrated in black and white. Suitable for boys and girls from ten to fifteen years of age.)

SOCIAL PROBLEMS CONNECTED WITH PRIMITIVE WOMAN

***Ellis, Havelock**

1911 Man and woman.

***Morgan, Lewis H.**

1901 League of the Ho-de'-no-sau-nee, or Iroquois. (Edited by Herbert M. Lloyd.)

***Parsons, Elsie Clews**

1906 The family. (An ethnological and historical outline.)

***Thomas, William I.**

1907 Sex and society: studies in the social psychology of sex.

1909 Source book for social origins: ethnological materials, psychological standpoint, classified and annotated bibliographies for the interpretation of savage society.

A LIST OF GOVERNMENT PUBLICATIONS ON INDIANS

The following list of government publications is taken verbatim from a price list published in December, 1914, entitled *Indians of North America*, which may be obtained on request from the Superintendent of Documents, Washington, D. C.

AGRICULTURE

Demonstration farms [for Indians]. 1910. 4 pages. (Indian Bulletin 2.) Paper, 5c.

Indian fairs. 1909. 6 pages. (Indian Bulletin 1.) Paper, 5c.

BURIAL CUSTOMS

Account of burial of Indian squaw, San Bernardino Co., Cal., May, 1874. (In Smithsonian Report, 1874, page 350.) Cloth, 60c.

CRADLES

Cradles of American aborigines; by O. T. Mason. (In National Museum Report, 1887, pages 161 to 212, illus.) Cloth, 90c.

EDUCATION

Indian education and civilization; by A. C. Fletcher. 1888. 693 pages. (48th Cong., 2d sess., S. Ex. Doc. 95. Vol. 2, pt. 2; serial no. 2264.) Sheep, $1.15.

Contents.— History from 19th century. Reservations. Tribes of New York. Missionary work during the 19th century.

FRENCH HALF-BREEDS

French half-breeds of the northwest; by V. Havard. (In Smithsonian Report, 1879, pages 309 to 327.) Cloth, 75c.

GAMES

Games of North American Indians; by Stewart Culin. (In 24th Ethnology Report, 1903, pages 3 to 809, illus., large 8°.) Cloth, $1.50.

INDIAN HOME

Memorial of Richard C. Adams on behalf of Delaware and other Indians in Oklahoma [asking for establishment of Indian home in Oklahoma]. 1908. 3 pages. (60th Cong., 2d sess., S. Doc. 592.) Paper, 5c.

IROQUOIS INDIANS

Iroquoian cosmology, 1st part; by J. N. B. Hewitt. (In 21st Ethnology Report, 1900, pages 127 to 360, illus., large 8°.) Cloth, $1.75.

MEDICINE-MEN

Medicine-men of the Apache; by J. G. Bourke. (In 9th Ethnology Report, 1888, pages 443 to 603, illus., large 8°.) Cloth, $1.20.

MONEY

Ethno-conchology, study of primitive money; by R. E. C. Stearns. (In National Museum Report, 1887, pages 297 to 334, illus.) Cloth, 90c.

NAVAJO INDIANS

Navajo weavers; by Washington Matthews. (In 3d Ethnology Report, 1882, 371 to 391, illus., large 8°.) Cloth, $1.15.

OMAHA INDIANS

Omaha sociology; by J. O. Dorsey. (In 3d Ethnology Report, 1882, pages 205 to 370, illus., large 8°.) Cloth, $1.15.

POTTERY

Aboriginal pottery of eastern United States; by W. H. Holmes. (In 20th Ethnology Report, 1899, pages 1 to 201, illus., map, large 8°.) Cloth, $2.15.

Origin and development of form and ornament in ceramic art; by W. H. Holmes. (In 4th Ethnology Report, 1883, pages 437 to 465, illus., large 8°.) Cloth, $1.30.

PUEBLO INDIANS

Study of pueblo architecture, Tusayan and Cibola; by Victor Mindeleff. (In 8th Ethnology Report, 1887, pages 3 to 228, illus., 3 plates in pocket, large 8°.) Cloth, $1.45.

SCHOOLS

Discontinuance of non-reservation Indian schools. Speech of Elmer A. Morse of Wis., in House, Feb. 6, 1908. (In Congressional Record of Feb. 10, vol. 42, no. 40, pages 1859 to 1861.) Paper, 14c.

Indian schools and their results. Speech of Marlin E. Olmsted of Pa. in House, Feb. 6, 1908. (In Congressional Record of Feb. 10, vol. 42, no. 40, pages 1781 to 1785.) Paper, 14c.

TRADE

Ancient aboriginal trade in North America; by Charles Rau. (In Smithsonian Report, 1872, pages 348 to 394.) Cloth, 60c.

TRAVELING

Primitive travel and transportation; by O. T. Mason. (In National Museum Report, 1894, pages 237 to 593, illus.) Cloth, $1.20.

TUCKAHOE

Tuckahoe, or Indian bread. (In Smithsonian Report, 1881, pages 687 to 701, illus.) Cloth, 70c.

PRIMITIVE WOMAN'S DISCOVERIES AND ACHIEVEMENTS IN COOKING

MABEL L. FLUMERFELT

Quite unconscious of the fact that definite scientific principles govern the processes of cooking and food preparation, primitive woman has worked out, by her own daily experience, many of the most important principles with which we are now familiar in relation to food and diet.

We may well call attention first to her selection of food. In this, nature proved to be woman's greatest helper, since it provided different types of food for different seasons of the year and for different climates. We know that in a cold climate the body requires more of the heat-yielding foods to keep it in working condition than are necessary in a warm climate; fats, such as whale blubber and oils, are liberally used by the inhabitants. Large quantities of meat consisting of deer, musk ox, sea mammals, and the like, are also consumed in the cold regions. Here only small amounts of the less concentrated fruit and vegetable foods are available; fortunately the body can adapt itself to the conditions and get on well without large quantities of them. Thus, the bulk of food eaten is not large as compared with the immense fuel value or energy that it furnishes to the body.

On the other hand, the warmer climate, where less concentrated food is required to furnish sufficient body energy, has a much more luxuriant vegetable growth. In either case, the three principal types of food material — namely, carbohydrate, protein, and fat — are present, and it has only remained for primitive woman to make the proper selections. The Eskimo has always obtained fat from fat meat and oils, protein largely from meat, and carbohydrate from the few vegetables, or plants, or the juices of plants, which she found growing in the warmer seasons of the year. The South American Indian woman has required less protein food and more carbohydrate material in the form of vegetables and fruit. She has used fish and eggs and animal meat, but in smaller quantities than the Eskimo has. Sweetened sap, grains, roots of plants, and plant leaves have furnished her with carbohydrate; and nuts have given her a very valuable source for fat, which she needs in smaller amounts than the Eskimo does.

Primitive woman has combined her foodstuffs very wisely. For example, she has made a preparation from maize, beans, meat, and vegetables, which has often served as a complete meal for herself and family. Another valuable food has been pemmican, which is a combination of ground meat, berries, and grease. This dish has been a favorite in cold regions. The fact that cereal products have formed the staple articles of diet is indeed very fortunate, since these materials we now know contain the various food substances in such proportion that they serve as a fairly complete food. Roots and seeds have been the most valuable forms of vegetable food, and this is true even at the present time. Sugar has been obtained from the pulp of the maize stalk by pounding and pressing out the juice, from the sap of trees, and from wild honey. Grasses have always been used for greens and for flavoring.

Primitive woman has learned that parched grain may be fed to sick persons with better results than may unparched grain, and she has accordingly applied this truth without the knowledge that partly dextrinized or malted food is to a certain extent predigested. That certain herbs may be used medicinally has also been discovered by primitive women, though they have not yet discovered just what the action of these herbs on the human body is; that is, whether stimulating, soothing, or healing. There has been no strict division into a diet of animal or vegetable substances, though in different climates one or the other type of food has often predominated.

The value of condiments in food preparation has not been unknown to primitive woman. She has evaporated large amounts of sea water to obtain salt. Highly flavored juices of plants have often been made use of as flavoring substances; spicy berries have been pounded into fine particles and added to food; acid substances, such as wood sorrel and wild grape, have also been used. Coloring material for various foods has been obtained by grinding petals of brightly colored flowers or fruits, or from the juice of berries.

Food preservation has always been carried on in many of its phases without understanding the principles of bacteriology or even knowing that such a thing as a microorganism or an enzyme existed. Food has been preserved by the following methods:

1. Drying in the sun or by hanging on sticks over the fire.
2. Smoking over the fire.
3. Freezing or keeping in cool places. Vegetables were often buried to keep them.
4. Packing in fat and thus excluding the air.

Food has been protected from vermin by storing it in wicker baskets and later in regular granaries devised especially as places for food storage.

Primitive woman's reasons for cooking food have been in the main to make it more palatable, to improve its appearance, and to give variety. She has known nothing of the chemical changes that heat produces in foods, though she has learned by experience that cooking removes certain disagreeable poisons or acid substances, since they dissolve in the hot water and are rendered harmless. She also has known that starchy vegetables are better cooked than raw, but she has not been aware of the fact that heat renders starchy substances more available for use by the body than they would otherwise be.

One of the most remarkable discoveries of primitive woman is the use of yeast in bread making. She has chewed grain for a long time, then removed it from her mouth and left it exposed to the air for some time before adding it to the dough. What happened to this grain while it was exposed to the air, primitive woman has not understood as we do now; but that some change took place in the portion of grain thus treated, and that this change made a difference in the dough to which such material was added, she has been certain, for the dough was made lighter, of better flavor, and, in general, more palatable.

The pit oven so often used by primitive woman was a very near approach to our modern fireless cooker, which we consider such a wonderful invention. In it hot stones were used to furnish the necessary heat, and these were kept excluded from air as much as possible by packing earth around them and the food during the cooking process. Other methods of cooking, such as boiling, roasting, and broiling, have had exactly the same principles involved as ours to-day, though they were then unrecognized. Only by studying the experiences of primitive woman in food selection and preparation do we come to realize how great is the debt of modern woman to her. Science has done much to give us a better understanding of food combinations and cooking processes, yet we cannot but accept with much gratitude the remarkable discoveries and achievements that primitive woman, with nature as her only guide, has made in this respect.

THE CAYUGA INDIAN FESTIVAL

The story of the Cayuga Strawberry Festival, which was given by some of the students in the College of Agriculture on the shores of Lake Beebe in May, 1914, is reprinted here from the program that was distributed to the guests at the first performance. It will be a guide for entertainments in rural communities where the mothers and the older daughters of the family have been making a winter's study of the subject of primitive woman. The illustrations will give an idea of details and suggestions for costuming. It would make a good program for the Fourth of July celebration of any community.

SCENE OF THE FESTIVAL

The scene is laid by the side of Lake Beebe in a Cayuga Indian village of the Wolf clan. Some women and young girls are busy at their daily work, while most of the men are absent on a hunting expedition. Preparations are being made for the annual strawberry festival, which is one of thanksgiving to the Great Spirit for the "first fruits of the earth."

FIG. 51.— *Some of the actors cooking supper after the Indian play was over*

Some small children are playing in canoes near the shore. One is listening intently to the old chief who smokes and dozes by turns near the long house, or talks in snatches to the boy. Some of the children are picking strawberries; others are watching the woman and the girls who are working at pottery, basketry, and the dressing of skins. An old arrow maker is teaching one boy who seems likely to become an apt learner. A matron, busy hoeing in the cornfield, is keeping watch of her papoose and of the little girls near-by who are amusing both themselves and the papoose with corn-husk dolls.

TIME OF THE FESTIVAL

The spring of 1737.

NARRATIVE[4]

The afternoon quiet of the little Cayuga village is suddenly disturbed by a sound of shots and loud calls in the woods on the opposite shore. The women and children remain more or less indifferent to the noise, however, until they see a band of men, two white men in European dress

[4] Since the action must necessarily be in pantomime it is thought best to give a key to the action and a brief narrative of the actual historical events on which that is based. Interested readers can find the details in Schoolcraft's *Archives of Aboriginal Knowledge*, Vol. IV, p. 324–341, and in Beauchamp's *History of the New York Iroquois*, p. 274–278.

and three Indians, emerging from the woods, and motioning for persons to bring canoes across to them.

One of the women recognizes the voice of her husband, Tawaragat, who has been absent for a long time acting as guide in the South. With two of her sisters she jumps into a canoe to comply with his demands, and the party is brought over to the village. One of the white men proves to be Conrad Weiser (the official interpreter for the Province of Pennsylvania and the agent for both the Iroquois and the whites), who

FIG. 52.— *Some of the girls who took part in the play in costumes that they made after Iroquois patterns and designs*

finds in the old warrior, Teyorongkeh, and the arrow maker, Dyonwadon, friendly Indians who had known him formerly at Schoharie, New York. These men cordially greet the others, Stoeffel Stump, the white companion, Owisgera, an Onondaga Indian guide, and Shikelimo, an Oneida Indian. The latter is already known to the village group as a viceroy who has been sent to eastern Pennsylvania by the Onondaga Council, and as a member by marriage of their own Cayuga nation though not of their Wolf clan. (This Shikelimo was the father of the famous Logan whose wonderful speeches to Lord Dunmore excited the admiration of Thomas Jefferson. The latter quoted them, and therefore they have been preserved in print.)

While Tawaragat is talking to his wife and looking around the plantation followed by the children, the white men sit down beside the old chief. He is the representative of the Wolf clan of Cayugas to the Onondaga Council of the Six Nations. It is to this council that Weiser is bound as an envoy with gifts from Governor Gooch of Virginia and President Logan of Pennsylvania, who are desirous of establishing peace between the allied Six Nations of the North (Senecas, Cayugas, Onondagas, Mohawks, Oneidas, and Tuscaroras) and the Cherokees and the Catawbas to the South, who are making trouble on their frontiers.

The whole Cayuga village gradually clusters about these men, and when they fall to discussing the probable outcome of the embassy, Weiser slips

FIG. 53.— *The arrival of Conrad Weiser and Stoeffel Stump. Note the eighteenth century costumes*

away to the long house, where he has spied an old woman working at her herb cleaning and bunching. To her he shows and then offers twenty-four needles and six shoe strings, begging in return some Indian corn bread. She waddles off to bring this bread, and for five small loaves she greedily takes the needles and the strings. By this time the Indian matrons are ready with true Iroquois hospitality to offer food to their guests, and all join in urging the strangers to remain in the village until their strawberry thanksgiving festival has been celebrated. The hunters, who have meanwhile returned laden with game, have heard the news from Tawaragat and join heartily in offering a friendly welcome. (The game was brought into the village by the hunters on this occasion, for it was meant for the use of the whole community. Otherwise, they would have had to

leave it outside the bounds, each hunter sending out his wife to cut it up and fetch it in for his own family's use.)

THE SA-NUN-DAT-HA WA-TA, OR CONFESSION DAY

The ho-nun-de-ont, or Keepers of the Faith, have summoned the Cayuga Indians of the Wolf clan to the Council of General Confession, which precedes each religious festival of the Iroquois Indians. The men, women, and children stand together in a circle. Each in turn holds the string of white wampum while he confesses his faults, with the hope and promise of future amendments rather than any idea of atonement. After this, in solemn procession the Indians walk with great precision a straight line on a trail towards the east; by this symbol they signify their intention to live aright in the coming year. During this time two of the Keepers of the Faith are exhorting them to do good and to avoid evil speech and action.

FIG. 54.— *Eli, the chief of the Onondagas, who led the pageant dances. He is the leader of religious ceremonials on the reservation*

HA-NUN-DA YO, OR THE STRAWBERRY FESTIVAL, A DAY OF THANKSGIVING

It is early morning. Active preparations for the feast are being made. The children busy themselves with picking strawberries, and the women with pots and kettles, fish and meat. Then at a call from the Keepers of the Faith, all the community gathers in council. Speeches of thanksgiving are reverently addressed to the Great Spirit for the gift of the strawberry, and exhortations to duty and virtue are made to the Indians by the Faith Keepers, in these words:[5]

Friends and Relatives:— The sun, the ruler of the day, is high in his path, and we must hasten to do our duty. We are assembled to observe an ancient custom. It is an institution handed down to us by our forefathers. It was given to them by the Great Spirit. He has ever required of his people to return thanks to him for all blessings received. We have always endeavored to live faithful to this wise command.

[5] Quoted from Lewis H. Morgan's *League of the Ho-dé-no-sau-nee, or Iroquois*, p. 189–190, which is the chief source of all the present knowledge of early Iroquois religious ceremonials.

Friends and Relatives, continue to listen:— It is to perform this duty that we are this day gathered. The season when the strawberry plant yields its sweet fruit has again returned. We are all thankful that it is so. We therefore expect all of you to join in our general thanksgiving to the strawberry. We also expect you to join in a thanksgiving to the Great Spirit, who has wisely made this plant for the good of man. We hope and expect that order and harmony will prevail.

Friends and Relatives:— We are gratified to see so many here, and we thank you all that you have thought well of this matter. We thank the Great Spirit, that he has been kind to so many of us, in sparing our lives to participate again in the festivities of this season. Na-ho'.

The Great Feather Dance, the O-sto-weh-go-wa, now follows. This has always been a prominent feature in religious festivals of the Iroquois. The steps and motions are controlled by traditions hundreds of years old. The water drum has always been used to make the weird notes. At last the music dies away, the men, women, and children rest from their dancing, and another series of thanksgiving addresses are given. That rite is followed by the burning of tobacco to the Great Spirit, who can be reached best by the incense that accompanies the Cayugas' prayer for protection and prosperity. This brings the religious ceremonies to an end.

The feast that follows the dance is in sharp contrast. Signs of joyous revelry break out; appetizing odors come on the evening air; and all the non-Cayuga men, their guests, are invited to share in the sunset feast of venison and fish, cakes and strawberries.

PERSONS REPRESENTED IN THE PAGEANT

MATRONS

Keeper of the Faith
Tawaragat's wife
Basket maker
Pottery maker
Herb woman
Keeper of the Faith
Skin dresser
Maker of corn-husk mats

MAIDENS

Skin dresser
Girl in canoe, decorating pottery
Girl in canoe, making corn-husk dolls
Cook and water carrier
Girl pounding corn and cooking

YOUNG MEN

Two fishers
Four hunters

WHITE MEN

Conrad Weiser, the envoy from Governor Gooch of Virginia
Stoeffel Stump, member of the Gooch embassy

INDIAN GUIDES

Shikelimo
Tawaragat
Owisgera

INDIAN CHIEFS

Arrow maker, Keeper of the Faith
Old chief, Keeper of the Faith and representative of Cayuga village to the Onondago Council

CHILDREN

Four girls and eight boys ranging from eight to ten years of age

Three native Onondaga Indians participated in the festival; one as basket maker, one as cook, and another as musician and leader of the Great Feather Dance.

THE CHEVALIER'S RETURN

Another set of local but typical Iroquois scenes was presented on the shore of Lake Beebe at Ithaca in May, 1915. For a plot, the drama called *The Glory of the Morning*, a Winnebago tale,[6] was used in the main. By permission of the author, Mr. William Ellery Leonard, and with the generous aid of Mr. Arthur C. Parker of the Bureau of Ethnology at Albany, the proper names and the allusions were changed so as to make the play fit the Cayuga region and the traditions and customs of Iroquois

FIG. 55.— *Indian hunters on the shore of Lake Beebe*

Indians. With this plot was combined a detailed background of industries and amusements for young and old, men, women, and children. Over a thousand feet of moving picture film was made of these scenes, and is entitled *The Chevalier's Return.* By request and by making proper guarantees for the use of this film, these scenes can be repeated for the pleasure of thousands of persons throughout New York State this winter in granges and schools, in vestries and town halls. The scenario is given here in brief.

[6] This play is published in *Wisconsin Plays* and is copyrighted by B. W. Huebsch of New York City.

SCENARIO

When the scene opens, a group of boys are shooting bows and arrows at a target under the instruction of an old Indian, Black Wolf, who is chipping arrowheads on a tree stump near-by. Three or four boys are playing in canoes at the water's edge, and one of them is teasing a group of small girls who are busy with their dolls and cradle boards. An older girl is making more dolls for them from a pile of corn shucks, and a woman is making a mat of the same stuff. Under a big tree to the right is a group of women and girls kneading and coiling clay into jars, and others making baskets of willow and raffia. A big iron kettle is hanging over a fire of hickory wood, and women and girls are making an appetizing soup.

Just then a shout is raised by the small boys who, in searching for arrows, have spied their fathers and brothers returning from the hunt. This party approaches in a few moments with game, a deer and some rabbits, and the women rush to their work of caring for it. While some begin to dress the skins, others cut up the meat, disposing of it for immediate or future use. Before this work is completed two men come down the lake in a canoe and land with their good string of fish, which are taken by a young girl, who deftly prepares them for cooking. The men, both the young and the old, settle down to rest from their labors and to talk, while the women are busy over the food supply.

Meanwhile, in front of the Iroquois long house, a matron, Glory of the Morning, has returned to her sewing, which she had left with undisguised reluctance when the hunters came in with their game. She picks up the buckskin shirt, which she is embroidering with beads, and quickly becomes unconscious of her neighbors. She looks eagerly and frequently up the lake, and is evidently watching and listening for the approach of a canoe. She notices that her boy, Red Wing, has returned from a hunting quest of his own during her absence, for a quarry of squirrels lie there at the door. Now seeing her, he returns, picks them up with pride to show her. After an enthusiastic account of his hunting, little Red Wing talks of Black Wolf, the old medicine man, and of his grandfather, Big Canoe. Glory of the Morning tells him that Black Wolf has been telling her a story that morning of his dream that Half Moon, Red Wing's French father, is coming back. She is very happy over it and still watches and listens for his canoe, even while she talks. But Red Wing is stolidly indifferent. He has only contempt for Half Moon, who, though a rich trader and kind father, is not an Iroquois Indian like his mother and grandfather. Just then, Oak Leaf, a fair-haired, blue-eyed, white-skinned maiden, dressed like the other Indian maids, comes running to the lodge followed by Black Wolf, who carries a calumet on which he has been binding sacred eagle feathers. She, too, has heard from Black Wolf of

the dream that foretells the return of Half Moon. She is full of joy and excitement; she wonders what presents he will bring her, and is indignant at Red Wing's attitude toward their French father, whom she adores. Black Wolf settles down and tries to talk to Glory of the Morning, who roams restlessly about. He wishes to complete the telling of his dream, which forbodes evil days as the outcome of Half Moon's return. He reiterates his belief that "good will not come forever to the Indian who is married in the white man's way." This spurs Glory of the Morning

FIG. 56.— *Making fire with a friction board*

into a defence of her marriage to Half Moon by Père La Rou by the "white man's way," after the children, Oak Leaf and Red Wing, were born.

Just here, the chevalier, called Half Moon among the Indians, returns by way of the lake. He is dressed like a trapper, with pack and gun, but wears a French military jacket and cap. The greeting from each of the group is characteristic. Glory of the Morning with a cry buries her head on his shoulder; Oak Leaf is openly delighted; Red Wing avoids his father's touch; Black Wolf treats him with friendly but formal dignity.

Glory of the Morning wonders at the military coat, and is disappointed that the chevalier will not put on the new buckskin shirt. All too soon she is made to understand that Half Moon has come to take his leave,

for he is to return now not to Montreal but to France to take up his duties as a chevalier, because his father has died and he is his only heir. She learns, too, that France and his chateau is no proper place for Half Moon's beautiful Indian wife, with her dusky skin and Iroquois ways of life. Oak Leaf, his beautiful fair-skinned daughter, and Red Wing are to go with him, however, and see the "great king," live in the chevalier's chateau, and Red Wing is to be his heir. All this delights Oak Leaf, who parts with Glory of the Morning with some regret, which is overborne with anticipated joy. Red Wing stoutly and doggedly rejects all such plans for his future. Black Wolf, the wise old medicine man, urges the right of each child to decide the question. The mother's almost silent agony after her first wondering appeals has all the Indian stoical dignity. The scene at the lodge closes with the departure of the chevalier and Oak Leaf, while the calm despair of Glory of the Morning, as she watches them go, moves Black Wolf to prophesy a great future for her son, Red Wing, as chief of his own people in his own land.

The neighboring groups, meanwhile, show some curiosity but keep apart. The girls play football near enough to watch furtively, but not to listen to Oak Leaf. The young men practice lacrosse with great glee, and the older men settle down to the moccasin game with the women to watch. The children become visibly sleepy and inactive. By the time the canoe bearing Half Moon and Oak Leaf is out of sight and sound, Glory of the Morning and Black Wolf have joined the group at the game of moccasin, and Red Wing is following eagerly the movements of the lacrosse players.

Gradually the Indian matrons lead their children off to bed within the long house, and active sport ends in the twilight.

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

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FARM HOME DEMONSTRATION SCHOOLS

Farm home demonstration schools have been held in New York State for the past two years. From October, 1914, to May, 1915, thirty-eight demonstration schools, with an average membership of about thirty-five, were held in twenty-five different counties. When this number of women

FIG. 57.— *A demonstration school in foods and cookery at Cherry Valley, New York*

come together to plan better things for the home and the community, there is a tremendous influence set at work.

Through these demonstration schools, the New York State College of Agriculture at Cornell, in cooperation with the United States Department of Agriculture, under the Smith-Lever Act, endeavors to bring to interested groups of women meeting together in their home towns or villages, some of the newer knowledge on the centuries-old problems connected with home-making.

Farm home demonstration schools can be held only between October first and June first, each school lasting for five days, with one session each day. The school begins on Monday at one-thirty or two o'clock, as determined by the local committee. The lecture and demonstration together last about two and one-half hours. Although as yet the school in foods and cookery has been the only one definitely organized, it is the aim to organize, as soon as circumstances permit, schools in sewing and dressmaking, house planning, household management, household sanitation, home furnishing, and kindred subjects. At the present time it is possible to maintain only one school at a time in the State; consequently it is impossible to grant all requests for schools. Those communities are favored first that show the keenest interest in the work, and that have not already received special attention from the College.

THE ORGANIZATION OF A DEMONSTRATION SCHOOL

The community in which a group of women desire a farm home demonstration school, may make application to the College. Whenever it is possible, the request is granted. If a demonstration school in agriculture is to be held in a community and a school in home economics is desired, it is best to request that the two schools be held at the same time in order that the arrangements may be made cooperatively. If agriculture is not to be a part of the week's work, and if at least twenty-five women pledge attendance for a school in home economics, request should be made to the Department of Home Economics of the New York State College of Agriculture at Ithaca for material with which to organize the school. The following is a sample of the application blanks used:

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY
THE DEPARTMENT OF HOME ECONOMICS

APPLICATION FOR FARM HOME DEMONSTRATION SCHOOL

Name of place where school will be held.............................County..................

Railroad ....Express...........................Telegraph...........................

Dates preferred for meeting ....

....

Room or building where classes will be held ....

Can a two-burner kerosene stove and an oven be furnished?............................

Name of hotel or boarding place for instructor..

Number of persons pledged for regular attendance at school at fee of seventy-five cents each for the week ....

Signature of local correspondent

Name..

Address..

Date ....

The entire community should then be canvassed in order to interest not only a few but all housekeepers. It is highly important that there should be a vigorous local chairman, who should divide the territory for the purpose of publicity among members of a committee representing the grange, the church, the school, and other organizations.

On the receipt of the application blank by the department, pledge cards are sent to the chairman of the local committee. These pledge cards are to be signed by persons purposing to attend the school, and to be returned to the department as an assurance of sufficient interest to warrant the placing of the school. The form of the card is as follows:

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

THE DEPARTMENT OF HOME ECONOMICS

REGISTRATION FOR FARM HOME DEMONSTRATION SCHOOL

Place ....

Date, from ....

to .... 191 ....

Will you be able to attend daily during the school? ....

In what subjects are you especially interested? ....

....

Name ....

Home address ....

The payment of seventy-five cents, with the return of the pledge card to the local chairman, entitles the member to the five lessons of the school. The chairman retains all fees until the close of the school.

If a school in agriculture is being held during the same days as is the school in home economics, by paying an additional fee of twenty-five cents, women may attend the forenoon sessions of the agricultural school, which by reason of a larger teaching force, has two sessions. In this case, the total fee is one dollar, instead of seventy-five cents.

Before the school can be secured there must be a paid membership of at least twenty-five, and there should be many more. The greater the community interest, the more widespread and potent are the results. All agencies that are interested in community affairs should be asked to cooperate — the church, the school, the grange, and all women's organizations. It is a community meeting.

Admissions for single lessons are not encouraged because the five lessons form a single, unified discussion; the loss of one lesson, especially the first one of the week, means difficulty in following the later lessons of the series. However, persons unable to attend all the demonstrations may secure single admissions at twenty-five cents each. If there are com-

pelling reasons why persons having membership for the week are unable to attend some of the meetings, a substitute may be sent on such occasions.

The membership fee of seventy-five cents is nominal. Its object is to guarantee local interest and at the same time to defray a part of the traveling expenses of the speakers. The State pays the salary of the instructor and furnishes all the cooking supplies for demonstrations and such equipment and illustrative material as are easily transported. The local committee supplies a place of meeting, arranges for

FIG. 58.— *A demonstration in foods and cookery*

adequate janitor service, and, for a school in foods and cookery, furnishes the following pieces of equipment, which are difficult to ship: one long table for literature; two side tables; two tables for demonstrating, size and shape of kitchen tables; two small, deep dishpans; one teakettle; one waste-paper basket; one small, covered stone crock, for garbage; one three-burner kerosene or alcohol stove, trimmed and filled; kerosene or alcohol for refilling; one portable oven, preferably with a glass door; some provision for keeping food overnight — window box, cold closet, or refrigerator. If there is no sink in the part of the hall used by the lecturer, the following are needed: two zinc or enameled water pails; one dipper.

It is a great accommodation to the lecturer if she is provided with a local assistant who helps for perhaps half an hour both before and after the meeting, as well as during the demonstration, if necessary. Membership in the school is the compensation for such assistance.

Board may be secured for the instructor in a home or at a hotel.

Experience with extension schools in home making has shown that no one makes a keener or more interested student than does the woman who

has her hands full with the real problems of bringing up a family, and who is searching for definite guidance toward meeting these problems. The school is intended to be especially helpful to young housekeepers, and particularly to the mothers of growing children.

The problem of taking care of the small children during the meeting may be solved by organizing a day nursery in a near-by house. Some competent woman may be engaged, or may volunteer, to look out for the little ones. This plan has proved successful in more than one school.

FIG. 59.— *The quartet at an old-fashioned singing school*

If the seating accommodations are ample, the older girls of the high school may be invited to attend the sessions of the demonstration school free of charge. If no course in home economics is given in the local school, it may be possible, with the cooperation of the school authorities, for a group of students, such as a teachers' training class, to attend the entire course, taking notes and afterwards being held responsible to their instructor for a written report of the work covered.

Music has been a means of uniting community interest in the furtherance of the demonstration-school idea. As there is no special appropriation for this work, only a limited number of communities can in one season enjoy this feature. With the assistance of the choirs and the Sunday schools of the neighborhood, an instructor sent by the College brings

together all lovers of music to practice old songs. The week then ends in an old-fashioned singing school, the atmosphere of which is carried out by old costumes resurrected from attic trunks.

At the termination of the school the local committee makes a general report to the College, according to the following form:

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY
FARM HOME DEMONSTRATION SCHOOL
REPORT FROM LOCAL COMMITTEE

Place...Date of school...

Number of members..............................Single admissions.......................................

Was the program of work on the whole satisfactory?.....................................

What suggestions will you make for our guidance in future schools? ....

Will a school probably be asked for another year?..

Can a Cornell study club be organized in your community?. ....

Were there any special sessions for school children?.... .. ..

Name..

Address..

Date..

It is greatly to be desired that the demonstration school should not end the study of home economics in the community. The Department of Home Economics, wherever practicable, continues the work by means of a study club, with the use of the reading course lessons as a basis of work and of correspondence on subjects relating to the home. Suggestive programs for study clubs may be obtained from the department.

DEMONSTRATION SCHOOLS IN FOODS AND COOKERY

Recent study of foods and of hygiene has shown the reasons for success or failure in many practices heretofore accepted without question. Thus the housekeeper is enabled to appreciate and hold fast that which is good, to eliminate that which is unnecessary or harmful, and to add much that is valuable and intensely practical. The call has come to home makers everywhere to restudy their food problems in the light of newer knowledge in order to be capable of dealing with them intelligently and successfully.

The school of foods and cookery lasts from Monday through Friday. Each lesson is divided into two parts, one dealing with practical elementary dietetics, the other with cookery.

The first year's work, as usually given, considers: (1) the food needs of the body, the make-up of the commonly used foods, and their value as

sources of power, as building material, and as regulators of body processes; (2) the feeding of young and of growing children; (3) the planning of balanced and satisfying meals. The talks are supplemented by colored food-charts, printed outlines, and other reference material. Members of the school are furnished with *A Syllabus of Lessons for Extension Schools in Home Economics*, The Cornell Reading Courses, Course for the Farm Home, Lesson 57, a pamphlet that outlines the talks of the series and contains numerous illustrative recipes. Notebook material and bulletins are distributed during the week.

The part of the lesson devoted to cooking is illustrated by a demonstration of the preparation of one or more dishes belonging to the class of

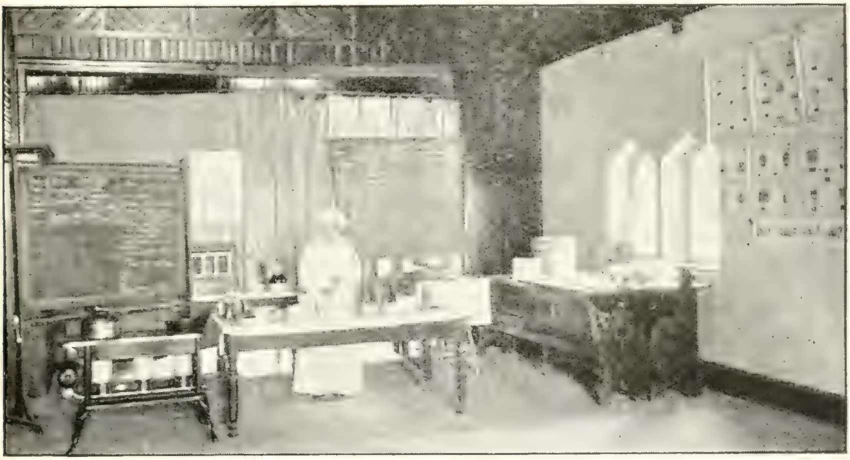

FIG. 60.— *A demonstration school held in a church*

foods under discussion. Special emphasis is laid on the principles that underlie the cooking of such foods as cereals, meats, vegetables, and flour mixtures.

A sample outline of the first year's work follows:

Monday: The needs of the body and how these are met by the food materials. Water, sugars, and starches in the diet; cereals. Demonstration: Rice cookery.

Tuesday: Fats and fatty foods in the diet. Milk as a food. Demonstration: Some things one cup of milk will make.

Wednesday: Nitrogen in the diet. The cooking of meats. Demonstration: Pork chops; how to make and use a simple fireless cooker.

Thursday: Why we need to supply mineral matter in the diet. Demonstration: Salads.

Friday: Planning meals. Demonstration: Desserts.

The work to be given the second year is determined by the needs of the class. The discussions on foods are continued. Subjects for demonstrations may be chosen from the following list:

Potatoes
Egg cookery
Bread making
Cooking the tougher cuts of meat; canning meat
Meat substitutes; cheese dishes
The principles of jelly making
Feeding the invalid and caring for the sick room
Food for the school boy and girl
The convenient kitchen

AN IDEAL FARM HOME DEMONSTRATION SCHOOL

When all the people of a community gather together for instruction, exchange of ideas, and social enjoyment, a perfect farm home demonstration school is practically insured. A close approach to the ideal was the school held at Jacksonville in August, 1915. It was carried on largely by the members of a summer-school class in extension in home economics. Jacksonville, which is only about fourteen miles from the College, was selected because of its accessibility. The people of the community cooperated admirably, offering the grange hall, the church, and the school building for the meetings. The entire community within a radius of several miles was represented in the enrollment for the six days.

The program included a five-session sewing school, a five-session cooking school, a five-session school in junior cookery, and a singing school each evening, with considerable additional work in music during the day. The program was as follows:

Friday:	2.30–3.00	Sewing demonstration: Skirt, Miss Wilder	Grange Hall
	3.00–4.30	Dressmaking shop	Grange Hall
	2.30–3.30	Junior games and music	School Building
	3.30–4.30	Junior home economics: Bread making, Miss Nye	School Building
	8.00	Food demonstration: Beans, Miss Brewer	Grange Hall
	8.00	Music: Folk and part songs, in charge of Miss Huff	Church
Saturday:	2.30–3.00	Sewing demonstration: Waist, Miss Wilder	Grange Hall
	3.00–4.30	Dressmaking shop	Grange Hall
	2.30–3.30	Junior games and music	School Building
	3.30–4.30	Junior home economics: Canning, Miss Nye	School Building
	8.00	Food demonstration: Canning, Miss Thayer	Grange Hall
	8.00	Music: Folk and part songs, in charge of Miss Huff	Church
Sunday:	12.00	Sunday school: Drilling in sacred songs, Miss Huff	Church
	8.00	Public song service, in charge of Miss Huff	Church

Monday:	2.30–3.00	Sewing demonstration: Sleeve and wool dress, Miss Grant	Grange Hall
	3.00–4.30	Dressmaking shop	Grange Hall
	2.30–3.30	Junior games and music	School Building
	3.30–4.30	Junior home economics: Poultry, Mr. Krum	School Building
	8.00	Food demonstration: Meats, Miss Walker	Grange Hall
	8.00	Music: Folk and part songs, in charge of Miss Huff	Church
Tuesday:	2.30–3.30	Sewing demonstration: Collar and cuff, Miss Wilder	Grange Hall
	3.00–4.30	Dressmaking shop	Grange Hall
	2.30–3.30	Junior games and music	School Building
	3.30–4.30	Junior home economics: Uses of bread and bread judging, Miss Nye	School Building
	8.00	Food demonstration: A balanced meal, Miss Brewer	Grange Hall
	8.00	Music: Folk and part songs, in charge of Miss Huff	Church
Wednesday:	2.30–3.30	Sewing demonstration: Children's clothes, Miss Wilder	Grange Hall
	3.00–4.30	Dressmaking shop	Grange Hall
	2.30–3.30	Junior games and music	School Building
	3.30–4.30	Junior home economics: Candy making, Miss Nye	School Building
	4.30	Food demonstration: Preparation of a picnic- and a school-lunch, Miss Brewer	Grange Hall
	6.00	Community picnic	Grange Hall
	8.00	Old-fashioned singing school	Church

Meetings will begin on time in order that they may close at a reasonable hour.

The dressmaking demonstrations and the food demonstrations will be open to everybody who is interested. All persons attending are requested to be prepared to take notes.

The dressmaking class, immediately following the demonstration, can be open to only fifteen persons. Every one in the dressmaking class should bring a thimble, scissors, a paper of number 5–10 needles, a paper of pins, a tape measure, and all the materials to be used in the making of a cotton dress for either house or afternoon wear. At the first lesson samples will be shown and advice given in regard to the selection of materials and designs. Persons already having material may work on it in the shop.

Each person attending the food demonstration is asked to bring a teaspoon.

Men, women, and children are invited to the singing school.

The sewing school, which was held in the grange hall, began each afternoon with a short demonstration, which covered various processes in garment making. During the remainder of each period, the school became a dressmaking shop, and the women sewed on materials that they brought with them. Assistance and suggestions were given in the selection of materials and patterns, as well as in the cutting, the fitting, and the finishing of garments. The average attendance at the sewing school was thirty; the enrollment in the dressmaking shop was limited to fifteen, but all persons interested in dressmaking were admitted to the demonstrations.

From two-thirty until four-thirty o'clock each afternoon the children were assembled at the schoolhouse. The first hour was spent in playing games, either outdoors or indoors, according to the weather. Following the hour of play the children were given instruction in cookery. The

lessons included a bread demonstration as preparation for a bread contest; a lesson in canning, in which each boy and girl canned berries brought from home; a lesson in making candy, which included suggestions for making simple, wholesome candies; and a lesson on the uses of bread. At the last session the boys and girls who were present at the bread demonstration brought bread that they had made according to a recipe given to them by the instructor. The bread was then judged and the points in the scoring of bread were explained in detail. Simple prizes were given; each contestant received some recognition for the careful work done.

There were two meetings each evening: a cookery demonstration held in the grange hall, and a singing school held in the church. In the

FIG. 61.— *The community picnic at Jacksonville*

cookery class fifty or sixty women were enrolled. Demonstrations were given on beans, meats, canning, and a balanced meal. The demonstrations were in charge of members of the extension class of the Department of Home Economics.

On the last afternoon of the school, there was held a community picnic, preceded by a demonstration of the preparation of lunches for school and for picnics. Because of rain the picnic was held in the grange hall. Some of the people of Jacksonville are shown in figure 61 seated at the tables enjoying the picnic supper. The dish washing was not a burden to any one because paper was used to cover the table, paper napkins were used, the food was served on paper plates, and the ice cream was served in paper cups.

In the church each evening nearly two hundred persons gathered to practice the old songs that will always be loved and will always live. The church choir and other singers, as well as many who were confident that they never could sing, enjoyed working together under the direction of the instructor in charge of the music, in preparation for the old-fashioned singing school, which was a fitting close to the week's work. The program of this school is given as follows:

YE FIRST PUBLICK MEETINGE OF YE JACKSONVILLE SINGING SCHOOL
AT YE CHURCH IN YE WILDWOOD
ON YE ELEVENTH DAYE OF YE FULLSOME MONTH OF AUGUST

Sara Buchanan Huff, ye Mistress of ye Singing School

"If Singing be so good a Thinge
I woulde all Men might Learne to Singe."

Ye School assembles itself at ye twentieth Hour, being just Candlelite, in goodly Companie with:

Many of ye Friends from near and far.
Ye Minister of ye Church, and Dame.
Ye Deacons and ye Elders of ye Church, and Dames.
Ye Leader of ye Sabbath School, and Dame.
Ye Master of ye Grange and divers High Officials of ye Grange, and Dames.
Ye Players upon ye Harpsichord in Church and Grange.
Ye Superintendent of Schools of ye First District, Tompkins County, and Dame.
Ye Members of ye School Board, and Dames.
Ye Teacher of ye District School, and Goodman.

Ye School is Called

Then: Takes place, as is ye Custom, ye Tuning of ye Voices.
Then: Ye Singing of divers Melodies led by ye School:
Song of ye Ancient Timepiece.
Melodie by Dvorak.
Glee: Come Where the Lilies Bloom.
Tenting To-night.
Then: Ye Candles are extinguished.
Note: Ye Minister of ye Church admonisheth Youths and Maidens as to seemly Behaviour during Absence of Candlelite.
Ye Magick Lanterne Pictures are shown on ye Sheete.
All present join lustilie in singing ye olde-time Songs of Home, Church, and Country.
Then: Ye Candles are set alight.
Then: Ye little Maiden Ruth Updike, but five years of age, sings bravely and alone a Song of ye Merrie Robin.
Then: Dame Osborn plays upon ye Harpsichord and sings: Song of ye Olde Cabin Home, which Song was writ by ye Dame's Music Master fifty years ago.
Then: Village Maidens give out Tunes of ye College. All present join in ye Refrains.

Then: Ye Mistress of ye School, Mistress Huff, sings, and ye Sister, Mistress Sharleigh Lake, plays upon ye Harpsichord.

Then: Ye Boy Scouts sing and whistle right merrily ye National Scout Song.

Then: Dame Osborn sings: 'Way Down in Maine — a Tale of exceeding Sadness to be lightened only by ye Song of Mary and her Lamb with Music of ye Dame's own composing.

Then: Mistress Stephens of ye far City of Washington sings: Ye Ballad of Bonnie Sweet Bessie.

FIG. 62.— *The gathering for the old-fashioned singing school at Jacksonville*

Then: Ye Singer Tommy Hopkins sings: Rollin' through an Unfren'ly World. Ye School joins in.

Note: Ye Goodman Deacon Beardsley is one of ye most sympathetic Rollers.

Note: On Sundays Tommy is Precentor, he then being Thomas.

Divers Members of ye School during the session recite pieces. These being:

Tragedy of a Gentleman of Color and a Mule, declaimed by Joshua Hamlet Ganoung.

A Just Estimate of ye New Church Organ, by Sister Prudence Pinter.

True History of Barbara Frietchie, by Sweet Katrina Sweet.

A Learned Discourse on Equal Rights, by Evalina Nazimova Wallenbeck.

Rightfull Account of her own Visit to ye Opery, by Aunt Sophrony Tabor (née Guyda Rumsey).

And lastly: A Skillful Exhibition of Ability; Katrina Sweet relating one Tale, Joshua Ganoung relating another Tale, Dotty Beardsley relating yet another Tale, all speaking at one and ye same Time.

The illustration on page 1720 was taken in the church directly after the singing school. Nearly three hundred persons were present; about sixty from Jacksonville assisted in the program. The children sang, the girls sang, the men sang, the church quartet sang, and the entire audience sang. Although the preparation had been brief, it was an evening of delightful entertainment, of spontaneous fun and merriment, dignified by the singing of the old songs. Old-fashioned costumes (Fig. 63) added to the enjoyment; a grandmother's wedding dress attracted special attention.

FIG. 63.— *An old-fashioned singing school is a fitting close to the week's work*

Members of the community and friends brought out old songbooks and some valued manuscripts for use in the singing school.

While it would be impossible to duplicate such a school in other parts of the State, because of lack of funds and of persons to give instruction, every community that asks for a demonstration school can give the enthusiastic, hearty support that characterized the one at Jacksonville. Such cooperation is the result when a strong local committee, well informed as to the purpose and the details of the school, spreads this information through the community until every woman is enrolled for the week.

REPORT OF FARM HOME DEMONSTRATION SCHOOLS FOR 1914–1915

The report of the farm home demonstration schools for last year is as follows:

Number of schools held	38
Counties reached	25
Total enrollment	1,238
Average enrollment for each school	32.5

Largest enrollment	60
Smallest enrollment	14
Average percentage of attendance of enrolled members (16 schools)	88.3
Highest percentage of attendance recorded of enrolled members	96
Single paid admissions	583
Average attendance	32.9
Average number of instructors	1.1
Average number of schools a week	1.5
Number of schools held in connection with farm demonstration schools	23
Number of schools held independently of farm demonstration schools	15
Number of schools with one session each day	36
Number of schools with two sessions each day	2

County	Place	Week	Number of instructors	Enrollment	Single admissions	Attendance, percentage	Average attendance
Allegany	Cuba	Mar. 1	1	23	9	......	22.0
Broome	Whitney Point	Jan. 25	3	60	39	......	58.0
Cattaraugus	West Valley	Jan. 11	1	25	8	......	26.0
Cayuga	Sherwood	Feb. 15	1	30	34	85.8	32.0
Chemung	Horseheads	Dec. 28	1	14	5	92.8	20.4
Clinton	Ellenburg Depot	Jan. 25	1	38	....	......	30.2
Columbia	East Chatham	Sept. 21	1	32	28	......	35.2
Cortland	Cincinnatus	Oct. 12	1	30	32	......	33.0
Cortland	Little York	Oct. 19	1	23	14	......	23.0
Cortland	Truxton	Oct. 26	1	18	35	......	20.2
Cortland	Marathon	Nov. 2	1	35	14	......	50.0
Cortland	Cortland	Nov. 16	1	46	46	......	49.0
Cortland	Cortland	Nov. 16	1	19	....	......	11.5
Cortland	Blodgetts Mills	Mar. 1	1	25	20	94.4	32.0
Delaware	Franklin	Mar. 15	1	29	41	......	47.0
Dutchess	Pine Plains	Feb. 15	1	45	20	......	31.0
Franklin	Burke	Jan. 11	1	40	11	78.8	32.5
Franklin	North Bangor	Feb. 1	1	32	19	......	40.2
Jefferson	Chaumont	Mar. 22	1	37	3	94.0	35.8
Livingston	Dansville	Jan. 25	1	53	....	87.2	46.2
Livingston	Linwood	Feb. 8	1	25	17	86.4	25.0
Montgomery	Fort Plain	Dec. 14	2	21	....	......	21.4
Niagara	Gasport	Feb. 1	1	34	27	96.0	38.0
Onondaga	Lysander	Mar. 8	1	25	20	......	38.4
Ontario	Stanley	Feb. 22	1	31	15	......	31.0
Oswego	Sandy Hook	Feb. 1	1	39	8	......	19.4
Oswego	Hannibal	Dec. 28	1	28	....	88.1	42.6
Oswego	Pennellville	Dec. 7	1	31	....	......	26.8
Otsego	Cherry Valley	Mar. 29	1	40	12	89.5	38.2
Otsego	Mt. Vision	Jan. 4	1	36	2	90.0	33.0

County	Place	Week	Number of instructors	Enrollment	Single admissions	Attendance, percentage	Average attendance
Sullivan......	Jeffersonville..	Nov. 30	1	35	5	81.0	28.4
Sullivan......	Monticello....	Dec. 14	1	24	4	87.0	20.4
Schuyler......	Catherine....	Nov. 30	2	47	8	......	33.0
Schuyler......	Watkins......	Mar. 8	1	19	20	......	31.0
St. Lawrence..	Gouverneur...	Feb. 22	1	58	9	89.0	52.1
Tompkins......	Jacksonville...	Aug. 6	8	200	....	......	....
Ulster........	Wallkill......	April 12	1	25	46	92.0	32.2
Wyoming.....	Pike.........	Jan. 18	1	34	5	81.8	28.8
Yates........	Dundee......	Nov. 9	1	35	7	......	34.0

THE CORNELL READING COURSE FOR THE FARM HOME

The lessons available in the Cornell Reading Course for the Farm Home are as follows and are free to residents of New York State:

11 The laundry
13 Cornell study clubs
15 Principles of jelly-making
17 The preservation of food in the home.— Part I
19 The preservation of food in the home.— Part II
21 The preservation of food in the home.— Part III
23 Rules for cleaning
25 Saving strength
27 Choice and care of utensils
29 Cost of food
31 Household bacteriology
33 Vegetable-gardening
35 The flower garden
37 Home economics at the New York State College of Agriculture
39 The farmhouse
41 Rules for planning the family dietary
43 The box luncheon
45 Hints on choosing textiles
47 A canning business for the farm home
49 Household insects and methods of control
51 A story of certain table furnishings
53 The Christmas festival
55 Rice and rice cookery
57 A syllabus of lessons for extension schools in home economics
59 Sewage disposal for country homes
61 Attic dust and treasures
63 The young woman on the farm
65 Farmhouse amusements for girls and boys
67 Canning clubs in New York State.— Part I. Organization

The preceding list is correct to November 1, 1915. The demand may at any time exhaust the supply of particular numbers. Requests will be filled as long as the supply lasts.

SUPPLEMENT TO

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

VOL. IV. No. 93 | AUGUST 1, 1915 | RURAL LIFE SERIES No. 12

FARM HOME DEMONSTRATION SCHOOLS

DISCUSSION PAPER

If you have been a member of a farm home demonstration school, your reply to the following questions will be appreciated. Your criticisms are invited for the good of future schools.

1. Have you, as a result of the discussion in the farm home demonstration school, made any changes in the feeding of the family; for example, the more liberal use of milk, vegetables, or fruits, the restriction of meat, or a more thoughtful regulation of the children's diet?

2. Have you had a better garden; canned a greater variety of summer vegetables; or paid more attention to the storing or the use of winter vegetables?

3. Have you taken greater interest in housekeeping through knowledge of the composition of everyday foods and their effects when used by the body?

4. Have you been stimulated to further study of household problems:
   a. In general?
   b. In using the Reading Course for the Farm Home?
   c. As a member of a study club?

5. Have you made changes which you consider to be for the better in:
a. Sanitary conveniences? If so, what?
b. Homemade or commercial labor-savers? If so, what?

6. Have you made or bought a fireless cooker? If so, do you find it as serviceable as you hoped it would be?

7. Have any steps been taken by the women of the community toward the improvement of sanitary conditions in schools, markets, or other parts of the community household?

8. Have you noticed any difference in community spirit as a result of the five days' session of the demonstration school? If so, in what direction?

9. Please name the three subjects that would be most helpful to you if it were possible to hold another demonstration school in your neighborhood.

First choice:
Second choice:
Third choice:

Name...

Address..

Date...

Member of farm home demonstration school at..................19...

The Cornell Reading Courses

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VOL. IV. No. 95 SEPTEMBER 1, 1915 FARMHOUSE SERIES No. 9

THE FIRELESS COOKER AND ITS USES

HELEN CANON AND LUCILE BREWER

To any one interested in labor-saving devices the possibilities of the fireless cooker are alluring. Within the last ten or fifteen years much ingenuity has been exercised in perfecting the construction of commercial fireless cookers, with the result that at the present time the principles of physics and sanitation are so well observed that the fireless cooker is in many households and institutions an indispensable piece of equipment.

FIG. 64. A HOMEMADE FIRELESS COOKER IN USE

THE PRINCIPLE AND ITS APPLICATION

The principle underlying the construction of homemade and commercial fireless cookers, including insulated ovens, is the maintenance of a constant temperature, high or low, by surrounding the food compartment with some good insulator, which tends to prevent the passage of heat. The food to be cooked is first thoroughly heated; it is then placed in the cooker where the stored

heat is locked up and utilized for cooking instead of being allowed to escape.

Primitive people have made use of leaves and earth to prevent the escape of heat from food being cooked by means of hot stones or hot ashes. Campers, who necessarily employ the more primitive ways of cooking, can testify to the long time that heat can be retained by covering hot ashes with earth.

The bean hole of lumber camps continues the cooking of parboiled beans for twelve or fourteen hours by the heat stored up in the food, the bean pot, and the stones, and retained by a covering of earth. The following extract is taken from a government bulletin entitled *Studies of the Food of Maine Lumbermen*, by C. D. Woods and E. R. Mansfield:

> The beans are not baked in the cookroom, but in the bean hole, which is simply a hole in the ground protected by a small log building. The beans are parboiled during the forenoon in an ordinary iron kettle on the stove in the cookroom. The bean pot in which they are baked is of iron with an overhanging iron cover, and it is filled with alternate layers of salt pork and parboiled beans. A fire is then built in the bean hole with both soft and hard wood to a depth of two feet, and when well under way is covered with stones and old iron, when the covered pot of beans is suspended over the fire. By the time the pot of beans has been heated to the boiling point the fire is burned to coals, and the stones and pieces of iron are red hot. The pot of beans is then placed directly upon these, covered with hot ashes and earth, and left to cook overnight, usually twelve to fourteen hours. In the morning the beans come from the hole steaming hot and are served for breakfast.

Feathers have been used as an insulator by the peasant folk of certain countries; they have followed the practice of placing kettles of boiling soup in feather beds, thus keeping the soup warm overnight.

The idea of a special box for conserving heat for cooking purposes seems to have originated in Norway, where hay was commonly used as the insulator. However, a close approach to this apparatus, according to one of the old Roman poets, was the Jewish beggar women's baskets lined with hay to keep warm the bits of food given to them. The farmer who lines with hay the box in which he carries home ice from town, makes use of the principle on which the fireless cooker is constructed. Many interesting applications of the principle could doubtless be brought to light by a definite search for them.

The *Scientific American* of October 28, 1911, in an article entitled *Inventions Ahead of the Times*, says: "Frequently inventions are made before the time is ripe for them to go into general use. This is illustrated in the so-called fireless cooker which has recently come into popularity and is now used to a great extent." The article mentions an English patent of 1857 and a United States patent of 1866, both of which embody

principles used in modern cookers. At the World's Fair in Paris in 1867, a Norwegian automatic cooker was exhibited and attracted fairly widespread attention. It is within only about the last ten years, however, that the fireless cooker has come to be a common piece of kitchen equipment. In 1905 a United States consular report calling attention to the use of the hay box in Germany led to an investigation of this method of cooking by the commissary general of the War Department Present-day scientific knowledge has made possible many modifications tending toward efficiency and convenience.

INSULATION

Heat moves from one place to another place of lower temperature by conduction, by convection, or by radiation. Conduction is the method by which heat moves from one part of a substance to another without visible motion of the parts of the substance; the heating of a flatiron is accomplished by conduction. Convection is the method by which heat moves from one place to another by the movement of the heated matter; the heating of a room by a stove is accomplished in part by convection currents in the air. Radiation is the method by which heat moves from one place to another by means of ether waves; in this way the earth receives heat from the sun.

Certain substances are better conductors of heat than are others; thus, metals are good conductors of heat, and nonmetals are poor conductors of heat. This fact is well exemplified by the use of a fireless cooker. First, the food is placed in a metal container, which readily conducts the heat from the stove to the food; then the metal container is quickly passed from the stove to its hole in the fireless cooker where it is surrounded by some nonconducting material, which tends to prevent the escape of the heat. Various nonconducting materials, or insulators, are used for this purpose.

The table (page 1732) from Carleton John Lynde's *Physics of the Household* compares certain substances on the basis of the number of heat units that pass through a layer of given thickness under given conditions. Air is shown by this table to be the best nonconductor of heat, but since it carries heat by convection currents, it would not be a good insulator if used alone. The best results are obtained by using one of the other substances of low-conducting power, packing it loosely enough to contain air, but closely enough to prevent convection currents in the air. The nonconducting property of the substances most often used is due largely to the air that they contain. A vacuum is the most efficient insulator, and it is used in the thermos bottle and in certain fireless cookers.

RELATIVE THERMAL CONDUCTIVITY OF SUBSTANCES

Substance	Number of heat units
Silver	1.0
Copper	.9
Gold	.7
Aluminum	.5
Brass	.26
Tin	.16
Iron	.12
Porcelain	.0025
Glass	.0020
Water	.0014
Cement	.0007
Asbestos paper	.0006
Cotton cloth	.00055
Wood	.00050
Paper	.00030
Flannel	.00023
Silk	.00022
Mineral wool	.00019
Cork	.00013
Sawdust	.00012
Felt	.00009
Horn	.000085
Cotton wool	.000050
Air	.000040

ADVANTAGES OF A FIRELESS COOKER

In these days when fuel is so easily available, perhaps it is only the particularly thrifty manager who is alert to the saving that may be effected in the wise use of a good fireless cooker. Hotels, cafeterias, college dormitories, hospitals, and various other institutions where there is ordinarily more careful management than in the average household, are using the fireless cooker extensively, especially for cooking certain meats, cereals, and other foods requiring a long application of heat. For example, the diminished shrinkage in hams when cooked in a fireless cooker has led to the use of this method by certain packing houses. However, economy in fuel, as well as in time and labor, is largely determined by local prices and conditions; that which may be economical in one locality or for an institution may not be economical in another locality or for a small home. The problem requires study on the part of each manager of a household.

ECONOMY OF FUEL

If a coal fire must be built in order to accomplish the initial heating of the food, the utilization of the heat as the fire is dying down must be

considered in estimating the cost of the fuel. If such a fire without replenishment of fuel would complete the cooking process, there would obviously be no saving in fuel effected by the use of the fireless cooker. However, there might be a saving in time and labor, as discussed further on.

FIG. 65. A COMMERCIAL FIRELESS COOKER WITH UTENSILS

A slow fire continued for the greater part of the day to boil a ham, for example, may be well utilized in winter for heating the house, heating water, and cooking other foods; in summer such a fire may be the cause of so much discomfort to the workers in the house that it is wiser to use the fireless cooker for long cooking processes, and to use the stove only during the cool part of the day and for short cooking processes.

The same is true when wood is used as the fuel, but in this case there is likely to be a greater saving in labor, because a wood fire generally requires more frequent replenishment than does a coal fire.

With such fuels as kerosene, gas, and electricity, a slow, even heat may be maintained at a comparatively low cost, depending on the local prices. However, for long cooking processes, the amount of heat needed to bring the food and the radiator to the required temperature before their being placed in the cooker, is generally less than the amount needed to cook the food on the stove.

ECONOMY OF TIME

If fuel is being burned, there is always more or less uneasiness about leaving the house or the room in which food is being cooked. Variation in the amount of heat may occur or the food may be forgotten, with the result that it may stick to the bottom of the utensil and burn. The fireless cooker makes it possible to leave the food without worrying about the results, although, as stated further on, there is a certain point at which the cooked product is at its best and should be removed from the cooker.

In households where it is necessary for the woman to be away from home all day, the fireless cooker helps to solve many a problem. Especially is this true in the case of families having small incomes, which necessitate obtaining the most nutriment at the lowest cost, because the nutritious foods of low cost, such as cereals, dried legumes, and tough cuts of meat, are those that require long, slow cooking to be made most palatable and of greatest use to the body. Under such conditions the fireless cooker is an absolute necessity if the family is to be properly nourished.

Whenever it is necessary for the various members of a household to have their meals at different hours, the fireless cooker is found to be a time-saver because the food may be kept hot in it until each member is ready to be served.

The fact that the cooking process need not be interrupted during transportation has led to the wide use of the fireless cooker by armies on the march; at the end of the journey the meal is ready to be served.

COMMERCIAL AND HOMEMADE FIRELESS COOKERS

The commercial fireless cooker costs more than does the homemade one; on the other hand, it is likely to be more durable, it seldom has any absorbent material exposed to the odor and the steam from food, the cooking compartment can be more easily kept clean, and it is frequently provided with a ventilating valve or some such device that makes baking and roasting possible. However, the homemade fireless cooker has proved to be wholly satisfactory for such foods as cereals, vegetables, dried fruits, custard, fowls, and certain cuts of meat.

There is practically no danger of fire from a homemade cooker unless

very hot radiators are used. Since thermometers are not used in the average home, and the radiators may be heated to an unnecessarily high temperature, it seems safest to advise against the use of radiators unless the insulator is not inflammable. Under no conditions can a very hot radiator above the food be safe, because it is too near the muslin of the cushion. While baking is impossible without the use of radiators, there are sufficient other processes for which the homemade cooker may be used to warrant the trouble and the small cost of making one.

The cost of a homemade fireless cooker may range from about one dollar and a half to eight dollars or more, depending on the materials used. If several sizes of aluminum pails with clamps and covers are bought for food containers, the cost may equal that of a small commercial cooker.

FIG. 66. A HOMEMADE AND A COMMERCIAL FIRELESS COOKER
These are slightly more than one foot high, which is the smallest size practicable

The insulated oven, or automatic cookstove, has the advantage over the ordinary fireless cooker of being still more economical in regard to heat and labor and of eliminating an additional piece of equipment in the kitchen, because, as ordinarily made, it has top burners also, and hence takes the place of the usual range. In the insulated oven both the preliminary heating of the food and the complete cooking process are accomplished; consequently, both the loss of heat occasioned by transferring the food container from the stove to the cooker and the labor of this motion are eliminated. Moreover, the walls of the oven itself are heated and do not draw the heat from the food. There are now on the market insulated ovens adapted to the use of gas, electricity, and

FIG. 67. AN INSULATED OVEN
This has an advantage over the ordinary fireless cooker in being still more economical of heat and labor

kerosene. The heat supply in some of these ovens is controlled by a dial hand that may be adjusted for the number of minutes for which the heat is required, at the end of which time the heat is cut off without further attention. A large insulated oven, modeled somewhat like an ordinary gas stove, is more expensive than is a fireless cooker; but the cost of a moderate-sized range with an insulated oven is practically the same as that of both a gas range and a fireless cooker. This is a subject worthy of investigation by one who is purchasing new kitchen equipment.

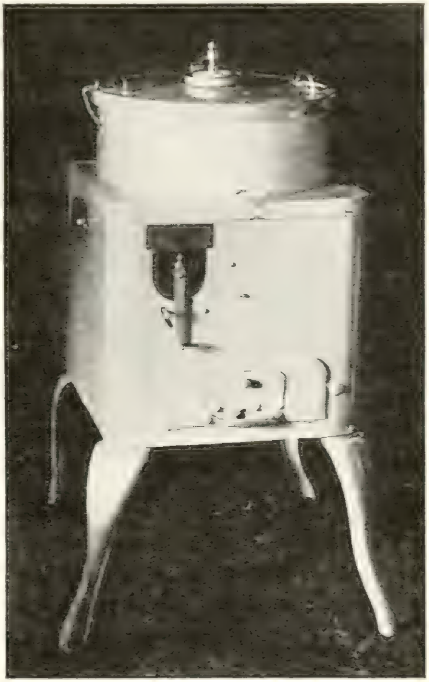

FIG. 68. ANOTHER TYPE OF INSULATED OVEN

The heat is furnished by gas, the supply of which is controlled by a dial hand

POINTS TO BE CONSIDERED IN BUYING A FIRELESS COOKER

INSULATION

The more perfect the insulation, the better are the results. There are certain trade mixtures of insulating materials, the secrets of which are not divulged. However, a reliable manufacturing company may be trusted to offer a good product.

EXTERIOR CASE

Attention should be paid to the durability of construction, and to the ease and thoroughness with which the cooker may be cleaned. The outer case may be made of well-seasoned and well-finished hardwood or of metal. Wood is better than metal as a nonconductor of heat, but metal is more easily cleaned.

INTERIOR LINING

The material used for lining the interior should be durable and such that it may be easily and thoroughly cleaned. Seamless aluminum, also nickle-copper, and enamel are used for this purpose. The old models containing flannel-covered cushions were distinctly inferior to the present models that have nothing but metal exposed on the interior and are consequently nonabsorbent and easily cleaned. In this respect the home-made cooker is necessarily deficient. Special attention should be paid in the case of an electric insulated oven to a seamless lining for the food

compartment, because without this the moisture due to the condensation of steam in the cooking compartment may reach the coils through which the electric current passes.

COOKING UTENSILS

The utensils used for food containers should be durable and free from crevices and seams where particles of food and harmful microorganisms may lodge. Seamless aluminum is perhaps most commonly used for this purpose. Each utensil should be supplied with a tight-fitting cover that can be clamped down.

VENT VALVE

For baking or roasting, a vent valve or a similar device for the escape of steam is desirable to produce the best results.

HOT PLATES

All fireless cookers are not equipped with hot plates, or radiators. For some cookery processes they are not necessary; but their use makes a baking temperature possible, and also prolongs the time for which a lower cooking temperature can be maintained. The plates are commonly made of soapstone, or steatite; iron is occasionally used. For baking, there are various kinds of racks on which to rest the plates, usually one plate being placed below and one above the food to be baked.

LOCKS AND HINGES

The locks, or clamps, and the hinges should be strong and well-fitted to insure absolute tightness. Some cookers are provided with stop hinges to prevent the lid from swinging back when it is opened.

SIZE

The quantity and the kind of food ordinarily to be cooked should determine the size of the cooker. In most cases a small amount of food in a large container does not hold the heat satisfactorily, but this difficulty may be overcome to a certain extent by using a small food container placed in a larger kettle and filling the intervening space with boiling water. Cookers with food compartments of various sizes are convenient because they allow the cooking of such foods as ham and chicken, as well as small quantities of vegetables, cereals, and the like.

COST

The cost varies with the size, the materials used in construction, and the number of conveniences and appliances furnished; it ranges from about five dollars to sixty dollars or more. Some cookers are supplied with bases, which raise the cooker to a good working level, thus eliminating unnecessary labor. Others that are so equipped utilize the space under the cooker for the storage of the cooking utensils and the radiators. There is also a cooker made as a part of a kitchen cabinet.

DIRECTIONS FOR MAKING A FIRELESS COOKER

A wooden box, a trunk, an ice box, a galvanized iron ash-can, and a wooden candy-bucket are among the articles that have been successfully used in the construction of a fireless cooker. If an ordinary box is used, it should be of heavy enough material to permit the use of good hinges and fastenings.

The inside container for the food utensil may be a bucket of agate, galvanized iron, or tin. It should have a tight-fitting cover.

Ground cork, sawdust, excelsior, mineral wool, paper torn in small pieces and crumpled, powdered asbestos, shavings, straw, hay, wool, and cotton batting are commonly used as insulators. Mineral wool and powdered asbestos are both good insulators and have the additional merit of not being inflammable; but they are harder to work with than are the other materials. Gloves should be worn by the person doing the packing, and care should be taken not to allow the material to enter the nose and the mouth. Cork is light in weight and has proved to be good. Excelsior is good and is easily obtained. Sheet asbestos one-eighth of an inch thick has proved to be the best weight for lining the outer case and covering the inner bucket; it is more durable and efficient than is the lighter weight, and it can be made to fit the curved surfaces more easily than can the heavier weight.

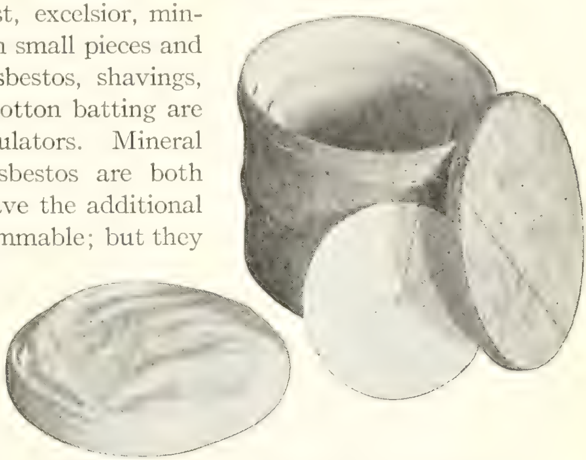

FIG. 69. A HOMEMADE FIRELESS COOKER

1. Select a box, a bucket, or a can of suitable size, and line it with sheet asbestos of one-eighth inch thickness. There should be a close-fitting cover, and this, too, should be lined with sheet asbestos.

2. Select an inner bucket or kettle with a tight-fitting cover and of such a size that there may be a space of at least three inches between the outer box or bucket and the inner bucket. Cover the outside of the inner bucket and its lid with sheet asbestos of one-eighth inch thickness.

3. Pack into the bottom of the asbestos-lined outer box or bucket a layer at least three inches deep of whatever nonconducting material is to be used.

4. Place the asbestos-covered inner bucket on the layer of nonconducting material in the bottom of the outer box or bucket, and pack the

space between the outer box or bucket and the inner bucket with more of the nonconducting material, filling the space to within about one-half inch from the top of the inner bucket.

5. Make a collar of zinc, cardboard, or sheet asbestos, to cover the exposed surface of the insulating material. Zinc is good for this purpose because it does not tear with constant use as do the other materials, it can be washed, and it does not rust. An old piece of muslin, which can be washed frequently, may instead serve the purpose of keeping the insulating material clean and in its proper place.

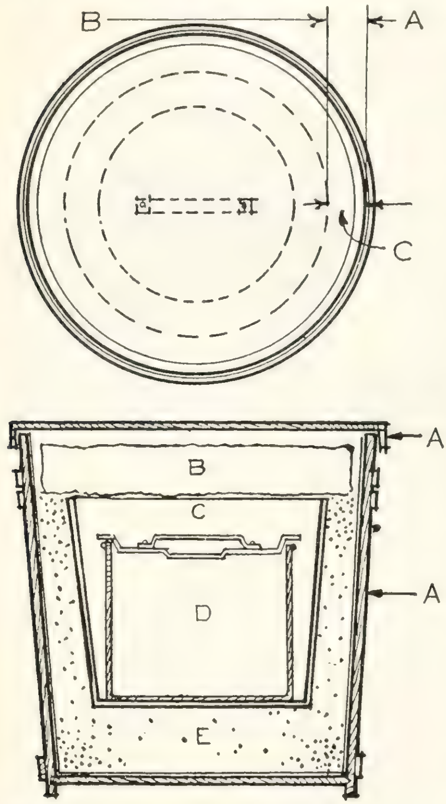

FIG. 70. DIAGRAM OF A HOMEMADE FIRELESS COOKER

Horizontal section: A, rim of outer bucket; B, rim of inner bucket; C, collar for keeping insulator in place

Longitudinal section: A, outer bucket; B, cushion; C, inner bucket; D, food container; E, insulator

6. Make a cushion of such material as muslin, which when filled with the nonconducting material will be at least three inches thick and will, as exactly as possible, fit into the space between the top of the inner bucket and that of the outer box or bucket. This cushion may be made by cutting out of the material two pieces of the desired shape and size, and putting them together with a straight strip of the desired width, with extra allowance for seams.

THE CARE OF A FIRELESS COOKER

The interior of the fireless cooker should be kept absolutely clean. It should be washed, dried, and sunned, if possible, each time after being used. It should remain open for several hours after use, and it should never be tightly closed when not in use. The observance of these precautions prevents the food from acquiring an unpleasant taste from odors or remnants of food previously cooked.

For convenience, all equipment to be used in connection with the cooker, such as hot plates, hooks, racks, and cooking utensils, should be kept near

the cooker. A shelf, a cupboard, or an improvised cabinet made from a box may serve as a convenient storage place.

The cooker itself should be placed near the stove both to prevent unnecessary loss of heat in transferring the food from the stove to the cooker and to save labor on the part of the worker.

The soapstone radiators when not in use may be kept warm on the back of the stove or in the sun in order to reduce the length of time required to bring them to the desired temperature when they are needed.

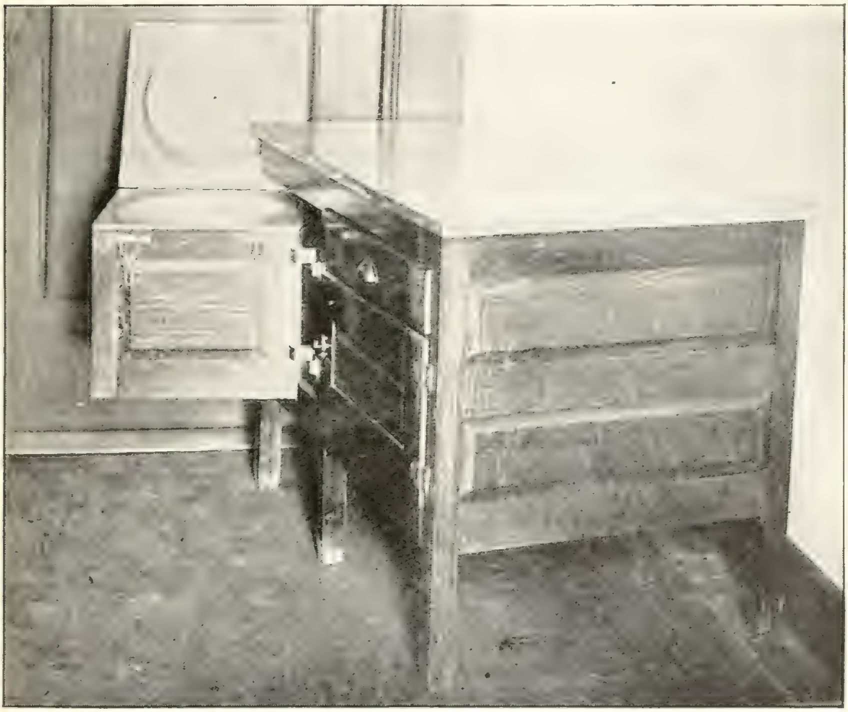

FIG. 71. A FIRELESS COOKER COMBINED WITH A CABINET FOR UTENSILS

THE USE OF A FIRELESS COOKER

The fireless cooker, like any other piece of equipment, should be used intelligently in order that the best results may be obtained. As previously stated, for certain cooking processes and under certain conditions it may be no more economical in fuel, time, or labor, than is the ordinary range; therefore, fireless cookery should be studied carefully by the housewife in order that she may discover its best applications. A few experiments with various kinds of foods, based on recipes adapted to the use of a fireless cooker, are necessary in order to give one the desired mastery.

The efficiency of insulation, the quantity of food, and the rapidity of the transfer from the stove to the cooker, influence the length of time required for the cooking. The temperature to which the radiator is heated also determines to a certain extent the length of time the food should remain in the cooker. The period that gives the best results is more or less definite for each food. However, since individual tastes differ, definite statements in regard to the required time should be verified for each household.

Care should be given to correct proportions, because there is no opportunity for the evaporation of excess moisture in the cooker.

Foods, such as pancakes, that require rapid cooking over a hot fire, are not well suited to the fireless-cooker method. Biscuits may be successfully baked in the cooker, but since the heat required to raise the radiators to the proper temperature will bake the biscuits in an ordinary oven, there seems to be no justification for its use in this case. However, for foods that require long cooking in order to be made more palatable and digestible, the fireless cooker is admirably suited.

Cereal products, such as rolled oats, cracked wheat, and hominy, give excellent results when cooked in a sufficient quantity of water in a fireless cooker. The first rapid cooking on the stove bursts the starch granules; the long-continued, slow cooking in the fireless cooker softens the fiber and completes the cooking of the starch, thereby making the nutritive matter available for use by the body.

The tough, and consequently cheap, cuts of meat are equally as nutritious as are the more tender and more expensive cuts, but they require long cooking at a low temperature in order to be made palatable. Intense heat shrinks and hardens meat fiber. The extraction of meat juices for soup, which necessitates long cooking at a low temperature, is well accomplished in the fireless cooker. If it is desired to retain the juices in the meat, the outside of the meat should be seared for a few minutes at a high temperature; the meat should then be cooked at a temperature somewhat below the boiling point of water until it becomes tender. The meat should be thoroughly heated to the very center before being transferred to the cooker. Fowls are especially good when cooked by this long, slow method.

Steamed breads and puddings are well adapted to the fireless-cooker method.

Hot beverages and sauces may be set aside in the cooker to be kept hot for serving.

The use of the fireless cooker for canning fruits is recommended by some persons. The juices of fruits may be satisfactorily extracted for jelly making. Various conditions, however, determine the practicability of its use for this purpose.

By means of the fireless cooker, frozen mixtures may be kept for several hours without melting; or a frozen mixture that does not require being stirred may be surrounded with ice and salt and placed in the food compartment to freeze, because, as stated above, proper insulation tends to prevent the passage of heat from either the inside or the outside of the cooker. A well-insulated cooker maintains a high temperature in one hole and a low temperature in another at the same time.

As a means of enabling one to have warm water at hand without keeping a fire, the fireless cooker is of use in homes where there is no boiler connected with the range, and especially where the fuel used is coal or wood, which necessitates building a fire.

RECIPES TESTED BY THE DEPARTMENT OF HOME ECONOMICS

In testing the following recipes it was found that there was only a slight variation between the time required by the commercial cooker with one radiator and that required by the homemade cooker in which one radiator was used. The homemade cooker contained powdered asbestos as an insulator, which made the use of one radiator safe. In the recipes in which no mention is made of a radiator, none was used. If no radiator is to be used, the time as stated with the use of a radiator may in some cases need to be increased; and the food may have to be reheated on the stove before being served.

BOILED BEEF

A piece of the under part of the round of beef, weighing three pounds, was boiled for fifteen minutes on the range, transferred to the fireless cooker, which contained one hot radiator, and cooked for three hours. This meat required ten minutes' heating before being served. It was tender and palatable.

FLANK ROLL

A piece of the cheapest, toughest part of beef flank, weighing three pounds, was rolled and fastened with skewers. It was then rolled in flour, seared well, and seasoned. One cupful of boiling water was added, and the meat was boiled for five minutes and transferred to the cooker. With two radiators in a commercial cooker, it was done at the end of two and one-half hours. With one radiator in the homemade cooker it was done at the end of three and one-fourth hours. As it was to be served cold, it was not reheated; otherwise reheating would have been necessary. It was perfectly tender.

BROWN STEW

3 pounds beef	1 bay leaf
4 tablespoonfuls fat	1 small celery stalk
2 tablespoonfuls flour	$\frac{1}{2}$ green pepper
1 small onion	Salt and pepper

1 quart boiling water

The beef was cut from just above the soup shank and was very tough. It was cut into one-inch pieces and seared well in the hot fat. The flour was added and mixed to a smooth paste. The remaining ingredients were then added, and the meat was cooked for five minutes before being transferred to the cooker. Two radiators were used in the commercial cooker. The meat was tender and hot enough to serve at the end of four hours.

BEEF CASSEROLE

2 pounds beef	2 green peppers, minced
3 tablespoonfuls fat	1 turnip, diced
2 carrots, diced	1 cupful tomato juice
1 onion, sliced	Salt and pepper

The beef was a tough cut from the neck. It was seared well and placed in a hot casserole. The other ingredients were added. The contents were allowed to boil for five minutes before being transferred to the cooker. The casserole was left in the cooker for four hours. The beef was tender and had a delicious flavor.

ROAST PORK

A roast of pork weighing two pounds was seared and placed in the commercial cooker with two radiators. At the end of one and one-half hours it was thoroughly roasted and was hot enough to serve.

DRIED PRUNES

The prunes were washed and soaked overnight in twice their quantity of cold water. They were then boiled for five minutes in the same water in which they had been soaked, and were cooked in the fireless cooker for four hours. No sugar was added. The result was about the same as if the prunes had been cooked on the range for two hours, with the possible exception of a slightly better flavor in the fireless-cooker product.

STEWED APPLES

The apples were pared and quartered, and the cores were removed. The apples were boiled in a thin sirup for three minutes before being

transferred to the cooker. One radiator was used. One and one-half hours were required for cooking the apples, which were somewhat pink from the long, slow cooking. They kept their shape well, and the flavor was good.

RHUBARB SAUCE

The rhubarb was washed and cut in pieces one inch long without being peeled. Three layers each of fruit and sugar were placed alternately in the kettle. The amount of sugar used depends on the desired richness of the sauce. No water was used. The kettle was placed over the fire until the boiling point was reached. It was then transferred to the cooker, where it remained for two and one-half hours. The sauce was a rich red color and had an excellent flavor.

EXTRACTION OF FRUIT JUICE FOR JELLY

A mixture of currants and raspberries was used. Enough cold water was added to just cover the fruit. The mixture was brought to the boiling point and placed in the homemade cooker overnight. The juice was clear and rich in appearance. The same method was used satisfactorily for the first and the second extractions of grape juice.

CANNED RASPBERRIES

Raspberries were prepared and packed into the jar, the rubber was adjusted, and the jar was completely filled with hot sirup. The cover was adjusted, and the jar was sealed immediately. It was placed in the fireless-cooker kettle, which had been warmed in order to prevent the jar from breaking, and was covered completely with boiling water. The kettle was covered at once and set away in the cooker overnight. This method proved to be particularly good for raspberries, plums, and peaches.

BAKED BEANS

1 pint navy beans
4 pints cold water
½ teaspoonful soda
1 teaspoonful mustard
¼ pound salt pork
1 tablespoonful minced onion
2 tablespoonfuls molasses
¼ teaspoonful paprika
Salt

The beans were washed and soaked overnight in the cold water to which the soda was added. They were then cooked in the same water for about thirty minutes, or until the skins slipped off easily. The remaining ingredients were then added, and the kettle was transferred to the commercial cooker. Two radiators were used. The beans were brown and tender at the end of six hours.

STRING BEANS

The beans were plunged into boiling salted water to which soda was added in the proportion of one-fourth teaspoonful to one quart of beans. They were brought to the boiling point and then transferred to the cooker. They were well done at the end of two hours.

RECIPES NOT TESTED BY THE DEPARTMENT OF HOME ECONOMICS

BEEF STEW WITH DUMPLINGS

2 cupfuls cooked beef, cut in cubes
2 cupfuls potatoes, cut in cubes
⅔ cupful tomato juice
1 onion, sliced
4 tablespoonfuls fat
1 teaspoonful salt
Pepper
⅓ cupful flour
1 tablespoonful parsley, minced
2 cupfuls water

Make a brown sauce of the fat, the flour, the seasoning, and the water. Add the vegetables, the meat, and enough water to almost cover the stew. Place the dumplings on the top. Boil the stew for five minutes, and cook it in the fireless cooker for one and one-half hours.

DUMPLINGS FOR STEW

2 cupfuls flour
2 teaspoonfuls fat
3 teaspoonfuls baking powder
½ teaspoonful salt
Milk, about ¾ cupful

Sift together the flour, the baking powder, and the salt; work the fat into this mixture with the tips of the fingers or with a knife. Add enough milk to make a stiff dough. Drop the mixture by spoonfuls on the top of the stew in order that the dumplings may steam without being covered with the gravy.

BREADED VEAL CUTLETS

2 pounds veal cutlets
½ cupful dry bread crumbs
Salt
Pepper
1 egg, slightly beaten
1 pint water or stock
½ cupful fat
4 tablespoonfuls flour
1 tablespoonful parsley, minced

Prepare the cutlets in pieces suitable for serving. Dip them in the crumbs, the egg, and the crumbs again, and brown them in the hot fat, using one-half the total amount of fat. Place the cutlets in the food container, and pour over them a brown sauce made from the remaining

ingredients. Reheat the contents to the boiling point before placing the kettle in the fireless cooker. Allow it to remain in the cooker for from two to four hours.

MACARONI ITALIENNE

1 cupful macaroni, broken in one-inch pieces
2 cupfuls stewed tomatoes, strained
1 cupful stock or water
1 medium-sized onion
1 bay leaf
1 teaspoonful salt
2 teaspoonfuls sugar
Pepper
1 cupful cheese, grated or shaved

Soak the macaroni in cold water for one hour, drain it, and place it in the food container. Add the other ingredients, except the cheese, bring the mixture to the boiling point, and set it in the cooker for two hours. Remove the onion and the bay leaf, and add the cheese. Allow the kettle to remain in the cooker until the cheese is melted.

TURKISH PILAU

½ cupful rice
2 tablespoonfuls green pepper or onion, chopped
1 cupful tomatoes
1 tablespoonful butter
1 teaspoonful sugar
1¼ cupfuls stock or water
1 teaspoonful salt

Wash the rice. If the pepper is used, discard the seeds. If fresh tomatoes are used, remove the skins, and cut the tomatoes in pieces before measuring them. Place all the ingredients together in the food container, bring the mixture to the boiling point, and transfer the kettle to the fireless cooker. Allow it to remain in the cooker for one hour. Stir the pilau lightly with a fork before serving it.

STEAMED CORN BREAD

2 cupfuls sour milk
⅓ cupful molasses
2 eggs
2 cupfuls cornmeal
1½ cupfuls white flour
1 teaspoonful soda
1 teaspoonful baking powder
½ teaspoonful salt
¼ cupful lard or drippings

Beat the eggs, and add to them the milk and the molasses. Sift the dry ingredients, and add them to the liquid. Then add the melted fat. Pour the mixture into a well-buttered mold. Place the mold in a kettle, and surround it with boiling water. Allow it to boil for thirty minutes; transfer the kettle to the cooker, and steam the bread for five hours.

GRAHAM PUDDING

- $\frac{1}{4}$ cupful butter
- $\frac{1}{2}$ cupful molasses
- $\frac{1}{2}$ cupful sweet milk
- 1 egg
- $1\frac{1}{2}$ cupfuls graham flour
- $\frac{1}{2}$ teaspoonful baking powder
- $\frac{1}{2}$ teaspoonful soda
- 1 teaspoonful salt
- 1 cupful raisins, seeded

Melt the butter, add the well-beaten egg, the molasses, and the milk. Mix the dry ingredients, and add to them the liquid mixture. Pour the mixture into a well-buttered one-quart mold or into several smaller molds, filling them not more than two-thirds full. Place the molds on a rack, such as a perforated can, in the cooker pail; pour warm water around the rack, bring the water quickly to the boiling point, and allow it to boil for thirty minutes if a large mold is used or for fifteen minutes if small molds are used. Place the pudding in the cooker for five hours. If sour milk is available, omit the baking powder, and add an extra one-fourth teaspoonful of soda.

MARGARET J. MITCHELL

STEAMED PUDDING

- 1 cupful sweet milk
- 1 cupful molasses
- $\frac{1}{2}$ cupful butter
- $3\frac{1}{2}$ cupfuls flour
- 1 teaspoonful soda
- $\frac{1}{2}$ cupful raisins or currants
- $\frac{1}{2}$ teaspoonful cinnamon
- $\frac{1}{4}$ teaspoonful ginger
- $\frac{1}{4}$ teaspoonful salt

Stir the soda into the molasses, add the milk and the melted butter. Add the flour sifted with the spices and the salt, and lastly the raisins or the currants dredged with some of the flour. Turn the mixture into a buttered mold, place it in a kettle of boiling water, and boil it for thirty minutes. Transfer the kettle to the cooker, and allow the pudding to steam for five hours.

STEAMED APPLE OR BERRY PUDDING

- 1 cupful flour
- 2 teaspoonfuls baking powder
- $\frac{1}{4}$ teaspoonful salt
- 2 tablespoonfuls sugar
- 1 tablespoonful butter
- $\frac{3}{8}$ cupful sweet milk
- 4 apples cut in eighths or 1 cupful berries

Mix and sift the dry ingredients; cut the butter into them or rub it in with the fingers; add the milk, cutting it in lightly with a knife. When the dough is barely mixed and no loose flour is left, toss it on a floured board, and pat or roll it lightly into a sheet one-half inch thick. Spread

the apples on it, and roll it as you would a jelly roll. Carefully place it in a well-buttered one-quart bread mold or a water-tight can. Cover it tightly, and place it in a cooker pail with enough warm water surrounding it to come two-thirds of the way to the top. Bring the water quickly to the boiling point, and allow it to boil for thirty minutes. Transfer the pail to the cooker, and allow it to remain there for three hours. Serve the pudding immediately with warm apple sauce and hard sauce. If preferred, instead of the apples add one cupful of berries to the dough, and serve the pudding with berry sauce instead of apple sauce.

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SUET PUDDING

½ cupful chopped suet
½ cupful molasses
½ cupful sour milk
1½ cupfuls flour
¾ teaspoonful soda
¾ teaspoonful salt
¼ teaspoonful ginger
¼ teaspoonful grated nutmeg
⅛ teaspoonful ground cloves
½ teaspoonful ground cinnamon

Mix and sift the dry ingredients, and add the suet. Mix the milk and the molasses, and add them to the dry mixture. Turn the dough into a buttered one-quart bread mold or water-tight covered can, place the can in a cooker kettle, and surround it with warm water to within three inches of the top of the can. Boil the pudding for thirty minutes on the stove, transfer it to the cooker, and cook it for five hours.

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STEAMED CRANBERRY PUDDING

⅓ cupful butter
⅔ cupful sugar
2 eggs
2⅓ cupfuls flour
1 tablespoonful baking powder
⅓ cupful milk
1 cupful cranberries

Cream the butter, and add the sugar gradually. Separate the eggs, and add the beaten yolks to the butter and sugar. Sift the baking powder and the flour together, and add this alternately with the milk to the mixture. Add the stiffly beaten whites of the eggs and the berries. Turn the mixture into a buttered one-quart mold, set the mold in hot water, and bring the water gradually to the boiling point, allowing it to boil for thirty minutes. Place the kettle in the cooker for five hours. Serve the pudding with sweetened cream or with hard sauce.

MARGARET J. MITCHELL

HARVARD PUDDING

- $\frac{1}{3}$ cupful butter
- $\frac{1}{2}$ cupful sugar
- 1 egg
- $3\frac{1}{2}$ teaspoonfuls baking powder
- $\frac{1}{4}$ teaspoonful salt
- $2\frac{1}{2}$ cupfuls flour
- 1 cupful milk

Cream the butter, add the sugar and the well-beaten egg. Sift the dry ingredients together, and add them to the mixture alternately with the milk. Turn the mixture into a buttered one-quart mold, set the mold in a kettle of warm water, and boil it for half an hour. Transfer the kettle to the cooker, and allow the pudding to cook for five hours. Serve it with warm apple sauce and hard sauce.

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TAPIOCA FRUIT PUDDING

- $\frac{1}{2}$ cupful pearl tapioca
- 1 quart water
- 6 apples, pared, cored, and sliced
- $\frac{3}{4}$ cupful sugar
- $\frac{1}{8}$ teaspoonful salt
- 2 tablespoonfuls butter

Soak the tapioca for one hour, place it and the other ingredients in a cooker kettle, and bring the mixture to the boiling point. Place the kettle in the cooker for one hour. Serve the pudding cold with cream. If it is preferred to serve the pudding warm, use only three cupfuls of water.

MARGARET J. MITCHELL

ST. JAMES PUDDING

- 3 tablespoonfuls butter
- $\frac{1}{2}$ cupful molasses
- $\frac{1}{2}$ cupful thick sour milk
- $1\frac{2}{3}$ cupfuls flour
- $\frac{3}{4}$ teaspoonful soda
- $\frac{1}{4}$ teaspoonful salt
- $\frac{1}{4}$ teaspoonful cloves
- $\frac{1}{4}$ teaspoonful allspice
- $\frac{1}{4}$ teaspoonful nutmeg
- $\frac{1}{2}$ pound dates, stoned and cut in pieces

Mix the molasses, the melted butter, and the milk, and add them to the dry ingredients, which have been mixed and sifted. Add the dates, and turn the dough into a buttered one-quart mold. Place the mold in water in the pail of a cooker, and boil the pudding for one-half hour. Place it in the cooker for five hours. Serve the pudding with hard sauce.

MARGARET J. MITCHELL

TIME TABLE FOR USE WITH A FIRELESS COOKER

Food	Proportion of food to water	Minutes for boiling on the stove	Hours in the cooker
Cereals			
Cornmeal	1 to 6	10	6 or all night
Cracked wheat	1 to 5	25	8 or all night
Cream of wheat	1 to 6	5	2 or all night
Farina	1 to 7	5	2 or all night
Hominy grits	1 to 5	15	8 or all night
Macaroni	1 to 4	5	2
Rice	1 to 4	5	2
Rolled oats	1 to 3	5	3 or all night
Vegetables			
Beans, dried (soaked and cooked in the same water)	1 to 4	5	6 or more
Beans, string	1 to 1	2	2
Cabbage	1 to 1	2	1½
Carrots	1 to 1	2	2
Onions	1 to 1	2	2
Potatoes	1 to 1	2	2
Dried fruits			
Apples	1 to 2	5	4 or all night
Apricots	1 to 2	2	4 or all night
Peaches	1 to 2	2	4 or all night
Prunes (soaked and cooked in the same water)	1 to 2	5	4 or all night
Meats			
Beef, boiled	....	15	3
Beef, pot roast	....	30	5
Chicken, stewed	....	30	3
Ham, boiled	....	20	7
Mutton leg or shoulder, boiled	....	20	6
Mutton stew	....	10	4
Breads and puddings			
Brown bread	....	30	5
Cup custard, steamed	....	....	1
Suet pudding	....	30	5

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SUPPLEMENT TO

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM HOME, MARTHA VAN RENSSELAER and FLORA ROSE, Supervisors

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VOL. IV. No. 95 SEPTEMBER 1, 1915 **FARMHOUSE SERIES No. 9**

THE FIRELESS COOKER AND ITS USES

DISCUSSION PAPER

The discussion papers offer an opportunity for the staff of the Department of Home Economics to become acquainted with the readers of the lessons in the course for the farm home. Will you ask questions, offer suggestions, and let us have the benefit of your experience in our effort to improve the home of to-day? Please answer the following questions, and return the discussion paper to the Supervisors of the Cornell Reading Course for the Farm Home.

1. Have you a fireless cooker?

2. For what foods do you most often use the fireless cooker?

3. What foods have you cooked successfully in the fireless cooker?

4. If you use a homemade fireless cooker, describe how it is made. Is it a success?

5. What methods based on the fireless cooker principle have you seen used for keeping foods either hot or cold?

Name. . . . .

Address. . . . .

Date. . . . .

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COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

VOL. IV. No. 74 OCTOBER 15, 1914 THE SOIL SERIES No. 1 revised

INTRODUCTION TO THE PRINCIPLES OF SOIL FERTILITY

ELMER O. FIPPIN

This lesson is the first of a series dealing with the maintenance of a proper physical condition and adequate productiveness of the soil. It points out the primary means by which soils are made productive, and outlines and introduces the discussion of the various factors by which this is accomplished.

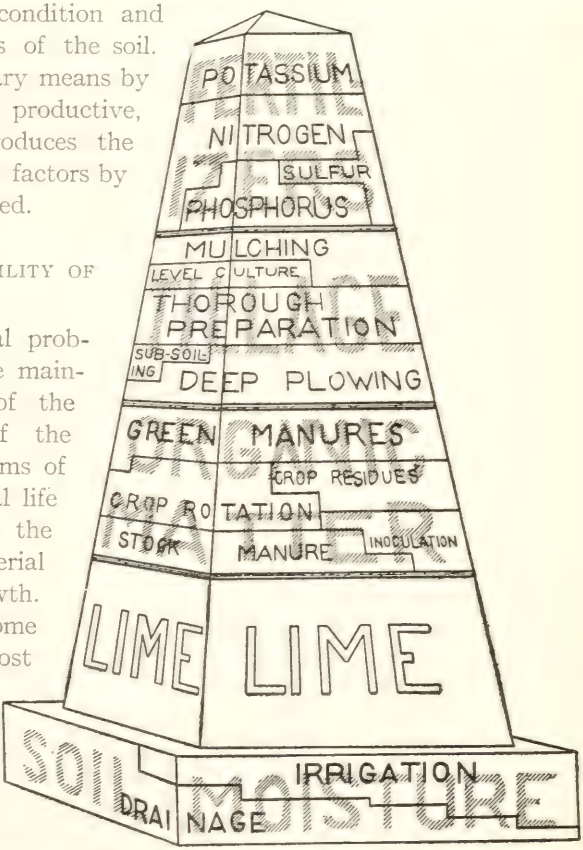

FIG. 1. — *This diagram represents the essential factors in a fertile soil in the order in which they should be adjusted, beginning at the base. It also calls attention to the primary practices by which these essential factors are controlled*

MAINTENANCE OF FERTILITY OF THE SOIL

The most fundamental problem in agriculture is the maintenance and increase of the productive capacity of the soil. All important forms of plant as well as of animal life depend on the soil for the ultimate supply of material necessary to their growth. The materials that come from the soil are the most likely to become the limiting factors in crop production. Therefore the great problem identified with agriculture, and ultimately with all other industry, is the maintenance of adequate productiveness of the soil, commonly considered under the head of soil fertility.

The soil is a great natural resource and its proper conservation is a problem of public concern.

The soil is productive just in proportion to its ability to meet the needs of plants for their best growth. These needs are diverse, including food, water, oxygen, heat, light, physical support, and sanitation. With one exception — light — these requirements are largely met by the mechanism and the constitution of the soil. This is accomplished by three interacting properties of the soil — its physical nature, its chemical constitution, and its biological activity. Each of these properties has many variations, which react on and largely affect the other two; so that the maintenance of fertility — the ultimate rational aim of all agriculture — presents an exceedingly complex array of problems. In farm practice the soil is changed for the better or for the worse by a variety of treatments, such as manuring, applications of lime, tillage, drainage, and fertilizers. Intelligent soil management involves the treatment of the soil by the most convenient and economic methods, so that the desired change in its character will result. The findings of the laboratory must be translated into terms of farm practice and reduced to the simplest form for the guidance of the busy tiller of the soil, taking into account the normal nature of the soil, the requirements of plants, and the limitations of farm practice.

The diagram on the preceding page represents, by a succession of courses built into the form of a monument, the essential factors in a fertile soil. The conditions represented by these courses are arranged, beginning at the base, in the order of their breadth of influence on the properties of the soil. They are also arranged so that one set of conditions will contribute most to the efficiency of the conditions represented by succeeding courses. Every person, in proceeding to improve his soil, should, so far as is practicable, eliminate the need of these treatments in the order suggested, so that the highest efficiency of the soil and the greatest benefit from the treatments and materials applied may be realized. In order to understand the reasons for the arrangement of the means of soil improvement in the order given, and to know when as well as how to apply them to a particular soil, it is essential that one have a considerable knowledge of the nature of the soil, of its modes of formation, of the many interacting properties of moisture, ventilation, food supply, temperature, and biological characters, and of the ways by which these are controlled. No simple rules will suffice. The variety of soils is so great that each farmer must to a large degree decide what is the best method of managing his particular soil, in the light of the principles involved. The preliminary statement in this lesson, together with the introductory diagram, perhaps as nearly as is possible summarizes the principles involved in the maintenance of permanent fertility of the soil. It has been well said by

Dr. W. H. Jordan that "the art of agriculture will rise no higher than the man on the land." The farmer must have a considerable knowledge of the intricate processes that combine to make a soil fertile, and his function is to cooperate with natural agencies and to direct their operation in his interest.

Soil moisture

Underlying all other requisites for maintaining the fertility of the soil is the proper regulation of the moisture supply. It determines the solution of plant-food, the physical condition of the soil, the efficiency of tillage, the effect of fertilizers, and the biological activity. It is therefore the first thing to be adjusted. This may involve irrigation, as in arid sections; or it may necessitate drainage, as in New York. Always, however, it means the proper handling of the soil in order to conserve and effectively use the water received and stored therein. Large areas of land in New York require better drainage, particularly of the subsoil.

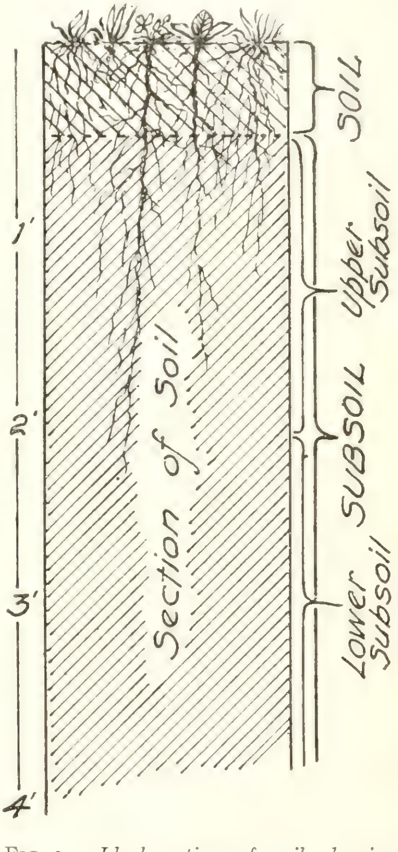

FIG. 2.— *Ideal section of soil, showing the large distribution of roots in the topsoil and their somewhat smaller distribution in the subsoil. Roots of many plants will penetrate to a depth of several feet if the drainage is good. The topsoil is generally richer in decaying organic matter, which gives it a darker color*

Lime

Lime stands second in range of importance. It maintains the proper balance between the acid and the alkaline constituents of the soil. As a result of tillage and cropping, soils may become more acid — a condition unfavorable to most of the important farm crops. Lime is best suited to counteract this tendency. It may be used in different forms, depending on the local situation of the farm.

Organic matter, or humus

The maintenance of a fair amount of decaying organic matter is essential because of the nitrogen which it contains and which is most economically

secured by the aid of certain soil bacteria and leguminous crops, and because of its many beneficial physical effects on the soil. Its increase is accomplished, according to circumstances, by means of large crop residues to which rotation and inoculation contribute, by the use of stock manure, and by the utilization of green-manure crops.

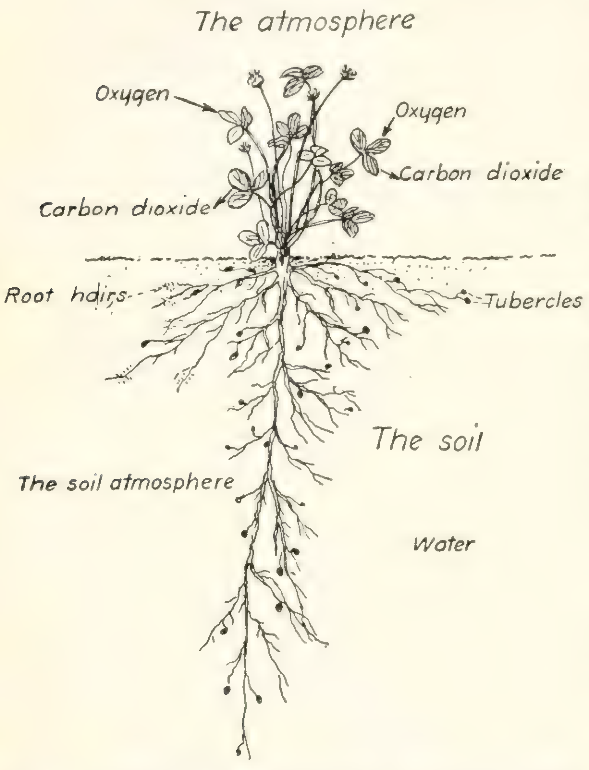

FIG. 3.— *Diagram of a leguminous plant (clover), showing its parts in relation to the soil and the atmosphere, and something of the circulation of the plant-food elements. From the atmosphere and water the plant derives carbon, hydrogen, and oxygen. From the soil it derives potassium, phosphorus, sulfur, iron, calcium, and magnesium. Nitrogen from the soil atmosphere is elaborated in the root tubercles by certain bacteria. Products of growth are given off by the leaves*

Tillage

Tillage, deep and thorough, stirs and fines the soil, incorporates manures and fertilizers that may be added, and contributes to general ventilation and sanitation. Various implements may be employed, according to the needs of the soil.

Fertilizers

The chemical nature of the average soil is such that, by the proper adjustment of the conditions of moisture, lime, organic matter, and tillage, the largest possible quantity of plant-food will be made available and the soil will be maintained in a sanitary condition. Nitrogen should be supplied through the organic matter. On many soils devoted to the deep-rooted, slow-growing crops, such as fruit, commercial fertilizers may not be needed. In other cases their use should be reduced to such quantities and forms as will give the greatest economic results. The treatments preceding the application of a fertilizer should all contribute to a rise in its efficiency.

CONSTITUTION OF THE SOIL

The most evident fact to a person examining any soil is that it is a mass of more or less pulverized rock thrown together either in layers or promiscuously. Mixed with this rock material is partly decayed plant and animal material, which gradually takes on a uniform dark color and pulverized condition and is known as humus. In the spaces between the particles of this mass of pulverized rock and organic material, water and air are held, and usually there is present a numerous flora of microscopic plants. The mass has a temperature that depends on the physical nature of the soil as well as on the prevailing climate.

The food for plants is derived from the soil particles, from the soil atmosphere, and from water, by chemical, physical, and biological processes.

FORMATION OF SOILS, AND CLASSIFICATION

We may first consider the ways by which soils are formed and the chief properties that result therefrom. While the farmer can materially modify any soil, the extent of such change is usually limited by economic considerations. In practice the agricultural development of any region that has been settled for a generation or more is a very reliable index to the soil resources of that region. The variation in agricultural development of different sections is largely a reflection of the inherent differences in soil conditions.

In the study of soil conditions in the United States up to the present date, more than sixteen hundred different soils have been recognized and many others remain to be identified. In New York State, which has an unusual variety of soils, more than one hundred types have been identified and described and many others will doubtless be recognized as the investigation proceeds.

The source of this information is the soil survey reports published by the United States Department of Agriculture and by many States. These are the most reliable general guides to the soil conditions and possibilities of any region. The soils are classified into types that include all material of essentially the same crop relation. This takes account of the material to a depth of three or more feet, since the subsoil, quite as much as the topsoil, influences plant growth, and in the subsoil the roots of plants are usually distributed. The occurrence of the types of soil is represented on maps; and in the accompanying report the types are described, together with the general agricultural situation of the region and its agricultural history.

The usual unit of these surveys is the county. In New York twenty areas have been surveyed or are in process of survey, and these have an

aggregate area of about fifteen thousand square miles. Not all the areas embrace an entire county, as smaller areas were sometimes made the unit in earlier work. The reports on many of these surveys are out of print, but they can usually be consulted in the Annual Reports on the Field Operations of the Bureau of Soils of the United States Department of Agriculture, usually to be found in the larger libraries. Every public

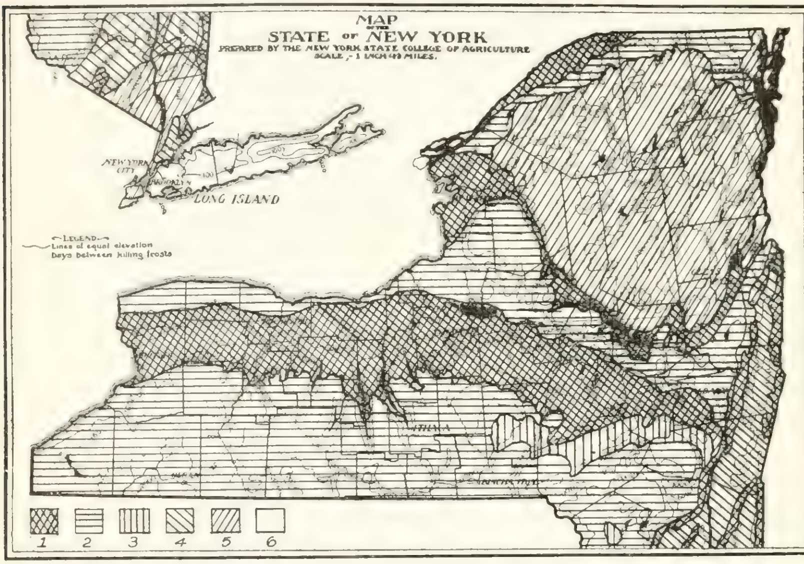

FIG. 4.— *Map showing the distribution of the important types of soil-forming rocks in the State*

1, *Calcareous (lime-bearing) rocks. Includes limestone, dolomite, and calcareous shales and sandstone*
2, *Gray, blue, and a little brown shale and sandstone. Non-calcareous, horizontally bedded*
3, *Red shale and sandstone. Non-calcareous*
4, *Gray and blue shale, slate, and sandstone. Much folded and somewhat metamorphosed*
5, *Igneous rocks. Mostly siliceous*
6, *Unconsolidated material of the Atlantic coastal plain*

library should have a complete set of these reports, the current volumes of which can be procured through the Congressman from the district.

The making of soil

Rain, wind, frost, glacial ice, streams, waves, plants and animals, and the solvent power of water, are at work continually on every exposed rock. By these agencies mountains have been reduced to plains, and lakes, and even oceans, have been filled to the condition of dry land.

We may see these processes in operation by the roadside after a shower of rain, or in the garden, as well as in mountain parks. In the Alps Mountains, in Switzerland, the mountain tops are capped by snow and ice which slide down the gorges with a tremendous grinding force; the

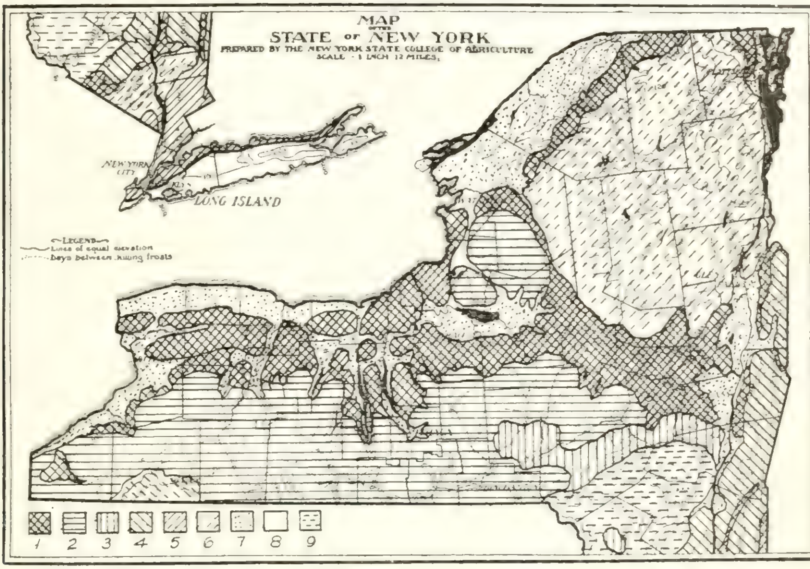

FIG. 5.—*Map showing the distribution of the more important groups of soils in the State*

1, *Calcareous (lime-bearing) glacial soils. Mostly gray to brown heavy loam. Ontario series dominant*

2, *Southern New York highland region. Glacial soils, yellow to brown stony loam. Volusia series dominant. Non-calcareous. Valleys occupied by gravelly and sandy terraces*

3, *Red glacial soil. Mostly stony loam. Highland region. Non-calcareous. Lackawanna series*

4, *Hudson valley upland. Gray to yellow and brown glacial stony loam. Surface very uneven. Rock exposures frequent. Non-calcareous. Dutchess series dominant*

5, *Glacial granitic and gneissic soils. Stony and non-calcareous. Heavy sandy loams. Gloucester series dominant*

6, *Igneous, mountain country. Non-agricultural*

7, *Lake bottom soils, stratified. Range from heavy clay to loose sand and gravel. Silt loam and clay loam predominate. Moderately calcareous. Dunkirk and Vergennes series dominant*

8, *Atlantic coastal plain soils. Chiefly rather loose quartz sand and gravel, with yellow silt loam topsoil*

9, *Catskill mountain region. Very thin, rough glacial soils of shale and sandstone origin. Largely non-agricultural*

ice melts, and the great volume of water resulting flows away with such violence as to furrow the rock slopes and carry away every bit of loose material. Trees and smaller plants pry their roots into the fissures, and winds send blasts of sand and dust against the ledges. Thus by degrees the mountain of rock becomes a plain of soil.

One may see these results wherever he is, and may observe the processes that have given rise to them. They may differ in magnitude, but not in kind. Note how frost breaks up clods of clay and even of stone; how the rivulets after a rain gully the hillside and leave a mass of gravel or mud where the water comes to rest. Then note the plants that spring up, and observe their roots — how they thread their way about through the spaces in rock and soil, expanding each a little by their growth and their search for water and food.

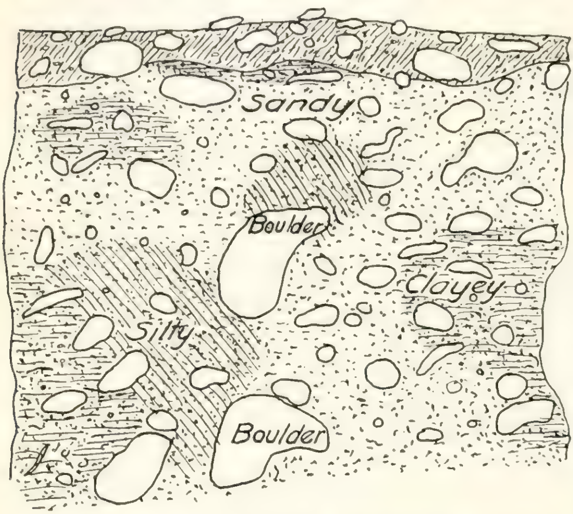

FIG. 6. — *Diagram representing a characteristic section of glacial till soil, and showing the lack of sorting and stratification. Coarse and fine material are mixed together promiscuously*

Scheme of classification

The differences in the physical and chemical properties of soil which determine its crop relations and its tillage properties are due to (1) the method by which the soil was formed, (2) the kind of material from which it was formed, and (3) the condition under which it has existed since it was laid down. As in the case of all natural objects, soils are classified according to a regular system of factors. These in the order in which they are applied, beginning with those of widest area of influence, are:

1. Mode of formation

Under this head come the various processes by which rocks and other soil materials are broken down to form soils, and by which they are carried, sorted, and deposited. They are:

(*a*) *The natural weathering or decay of rocks to form residual soils.*— The decay of many feet of limestone may form only a few feet of soil. Shale rock may be changed to soil with very little loss. In New York residual soils are of limited extent and are found south of the Allegheny river in southwestern New York where they form rough land derived from shale and sandstone rock.

(*b*) *The growth and accumulation of plants to form peat and muck soils.*— Many small areas of these are scattered throughout the State, usually in swampy places.

(*c*) *The transportation, sorting, and deposition of soil material by water.*— This includes stream bottoms, and material laid down by lakes and by the ocean. Such soil is always stratified, or banded, each layer with nearly one size of material. Much of the best land in New York belongs in this group. It includes the rich river and creek bottoms, the clays and sandy loam soils of the larger valleys and adjacent to nearly all the lakes, and the greater part of Long Island.

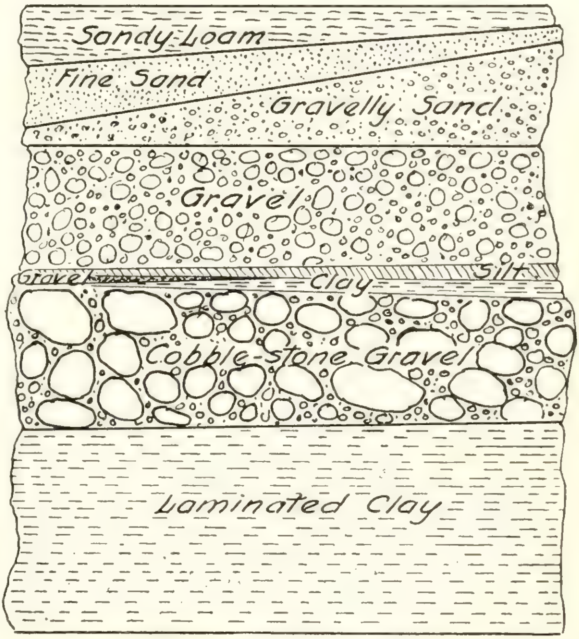

FIG. 7.— *Diagram representing a section of stratified (layers) soil deposited by water. The different sizes of particles that make up each layer were sorted out by flowing water. The more rapid the flow, the larger is the size of the particles deposited. Clay is formed only in very quiet water*

(*d*) *The transportation, sorting, and deposition of soil material by wind.*— This includes sand dunes, and probably also great areas of fine soil in the Middle West, called loess. There is no such soil in New York.

(*e*) *The mixing and transportation of soil material by glacial ice.*— The northern half of the United States, including nearly all of New York, was at one time, ages ago, covered by a great mass of ice that pushed down from the North. The influence of this experience on our soils was profound, and accounts for the great variety of rock usually found in our soils and for their heterogeneous nature. Nearly all the hill land belongs in this group. It includes practically the entire State above an elevation of eight hundred to one thousand feet, and considerable areas below that elevation adjacent to Lake Ontario. It has a great variation in agricultural value, depending on its thickness, the amount of stone, and the kind of rock from which it was formed. Such soils are without layers or stratification.

(*f*) *Gravity.*— A further agency in soil formation, which is of small importance in this State, is gravity, which accumulates a mass of rock débris at the foot of steep slopes.

2. *Source of soil material*

Soils are made up chiefly of pulverized rock, and the kind or kinds of rock from which a particular soil was formed has a considerable effect on both its physical and its chemical nature. A large number of kinds of rock are recognized by geologists. A few of the groups that cause considerable differences in soils are: (a) original crystalline rocks, such as granite; (b) sandstone, shales, rocks, and slates; and (c) limestones and marbles. The proportion of lime in a soil is determined to a large extent by the kind of rock from which it was formed, as well as the way in which it was formed. Where the rock is pulverized without much washing, this effect is especially marked. In New York the most calcareous soils occur in the neighborhood of the limestone formations, but not necessarily on them, due to the movement and mixing by glacial ice and water. They are especially well developed in a strip of country ten to twenty miles wide and extending southward from a line through Utica, Syracuse, Rochester, and Niagara Falls. They are also found in detached areas in the St. Lawrence valley, the Mohawk valley, and the Hudson valley region.

3. *The series properties*

The color, drainage, content of organic matter, and lime, have important influence on the productive power of soil, and are therefore recognized in their classification. This is called the series division.

4. *The type properties*

Finally, and perhaps most important in practice of any single property, there is the fineness, or texture, of the material — whether gravel, sand, silt, clay, or some mixture of these. As a result of mixture, there are produced loams, clay loams, sandy loams, and silt loams. The composition of these will be described in a subsequent lesson.

FACTORS THAT MAKE A SOIL FERTILE

The soil must be viewed as a factory, in which the various materials essential to plants are contained and in which many processes that contribute to fertility are carried out. The efficiency of the soil depends very largely on the nature and openness of the soil structure, and this in turn is largely determined by the fineness of the soil particles and their arrangement. If the soil is too open and porous, sufficient water is not retained, the soil is inclined to be warm and droughty, and crops do not thrive. On the other hand, if the soil is too compact and impervious,

sufficient water is not retained. or is unavailable, ventilation is poor, the growth of the microscopic organisms that contribute to fertility is hindered, and the plant-food that the soil may contain is largely unavailable.

Through the fineness of the soil, and its tilth, or condition of granulation, all these properties are largely regulated; and the function of tillage is to exercise some measure of control over them. But if a soil is too full of water, it has poor ventilation, and, when tilled, is inclined to run together and become puddled and hard. Hence reasonable drainage is essential to good tillage.

The proportion of humus, or well-decayed organic material, has a great influence on the tilth of the soil. Not only does the humus help to keep the soil loose and friable, but also it makes the color dark; thereby the soil better absorbs the rays of the sun, which results in a higher average soil temperature. Humus is also the chief storehouse of nitrogenous plant-food in the soil. The successful farmer has always assigned great value to the presence of this constituent in the soil, and its gradual exhaustion under unwise management is one of the most noticeable changes in the process of soil exhaustion. In fact, soil exhaustion frequently means merely a change to such a bad physical condition that the soil cannot carry on its proper functions, and the plant-food that may be present is therefore not available.

Plants use large quantities of water during their growth, and practically all of this must come from the soil. It is held in the pores in the soil, much as a sponge retains water.

In all sections of New York the rainfall is sufficient to produce maximum crop yields if the water can all be used effectively. Not only must the soil be able to collect and hold this water in forms that plants can use, but also loss of the water by evaporation must be prevented as far as possible by the maintenance of a mulch. Tillage at the right time and in the right manner is an important aid in securing this result. An intimate understanding of all the processes of moisture retention, movement, and loss, together with the means for their control, is essential to the best utilization of the rainfall.

The adjustment of the water supply in the soil largely controls the ventilation of the soil, which is essential to the growth of the beneficial forms of soil organisms and to the penetration of plant roots.

The amount of water in the soil, and the color of the soil, largely regulate the soil temperature.

Plants use ten elements as food. These are carbon, hydrogen, oxygen, nitrogen, potassium, phosphorus, sulfur, calcium, magnesium, and iron. The first three of these are obtained from the air and from water. The last six are obtained entirely from the rock particles of the soil. Nitrogen

stands alone. Available nitrogen is derived from the decay of the organic matter in the soil. The original supply of the element is the atmosphere, of which it forms about eighty per cent. But this free nitrogen is not available to the higher plants, and the operation of certain microscopic plants in the soil, called bacteria, is essential to its collection and elaboration into available forms.

The plant-foods derived from the rock particles are termed mineral elements and are used in different quantities by different plants. They are arranged above in the order of the quantities used by plants. In the soil particles they occur in various chemical combinations, and the amounts present vary greatly in different soils. In an acre of soil a foot

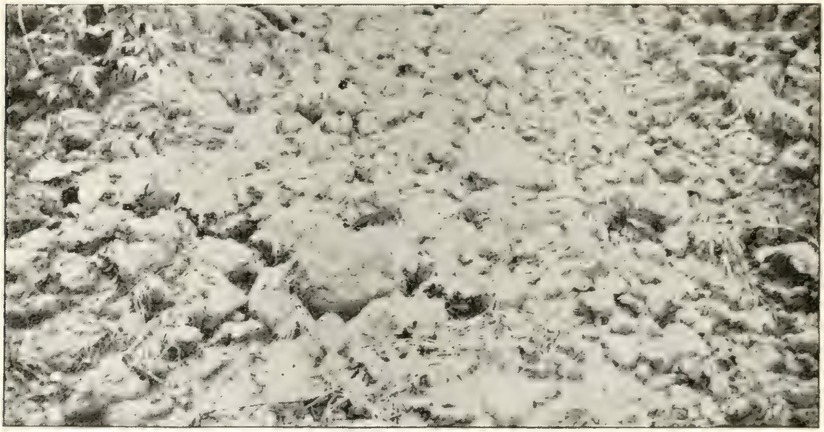

FIG. 8.—*A clay soil in bad tilth (physical condition). Too lumpy and coarse*

deep, there is usually many hundred times as much of these plant-food elements as is used by a single crop. Similar amounts occur in the subsoil. The elements are taken up by plants in solution in the soil water. In the soil particles they are very slightly soluble, and their availability is largely controlled by the fineness of the soil, its permeability, the amount of water present, the temperature and ventilation, and the amount of humus and lime in the soil. These constitute a further reason for the proper adjustment of the soil factory. The use of commercial fertilizer in a soil in poor condition would have small effect to make it fertile. This is the reason for presenting the diagram on the first page, in which commercial fertilizers are placed as the last instead of the first means usually to be employed in order to increase crop yields.

It is not usually possible to determine by chemical analysis the kind of fertilizer needed by a particular soil, since such analysis gives no infor-

mation about the availability of the large amounts of plant-food already present in the soil. Trials of fertilizers on growing crops in the field are the most reliable guide.

CONCLUSION

It may be evident from this brief discussion, how complicated is the soil in which plants grow, as well as the processes, natural and artificial, by which it is rendered productive. It is the part of the farmer to direct those processes by his various treatments, such as drainage, irrigation, the use of lime, organic matter, and fertilizer, and the practice of tillage, manuring, and crop rotation. He must consider not merely the thin

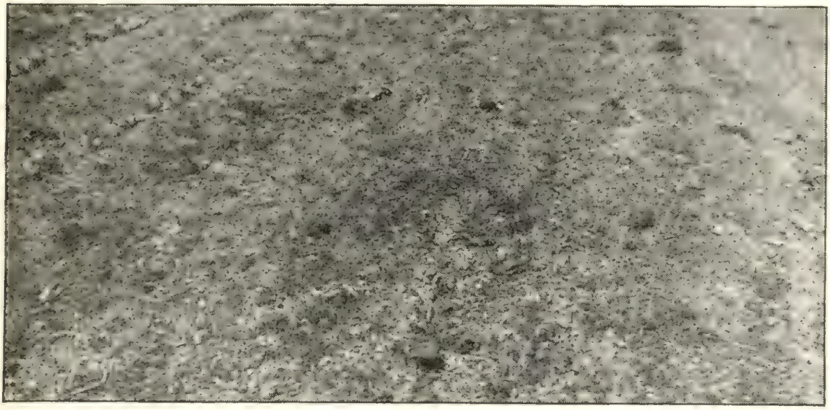

FIG. 9.— *Soil in good tilth. Fine and granular, and in proper condition to have a good relation to moisture and ventilation*

surface layer turned by his plow, but also the subsoil to a depth of at least three feet, which may be as capable of holding water and feeding plants as the topsoil when it is put in proper condition. Neglect of the subsoil is frequently the cause of poor crops.

The soil, and the subsoil to a depth of two, three, or even five and six feet, should be in condition to permit the growth of crop roots. When that is possible there will be much less complaint because of the lack of rainfall and the exhaustion of plant-food. That such use is possible is frequently shown on individual farms in many parts of the State, and especially by the use made by plants of the deep subsoil in arid and semi-arid regions under small rainfall but where wise irrigation is practiced. Deeper farming is one of the great needs for better soil management. This means much more than deeper plowing, helpful as that will prove. The depth of soil that can be turned by the plow is greatly limited. Deeper farming means the better use of the subsoil, which is to be accomplished by good underdrainage and by the use of deep-rooted crops in

rotation, so that the large store of plant-food in the subsoil, and its capacity when in good physical condition to hold available moisture, are utilized. A root zone of three to four feet should be the aim; and when this is realized and well managed, there will be much less need of fertilizers and of irrigation in New York.

The recuperative power of the soil is very great, and if deeply utilized and well managed it will continue to produce good crops for unnumbered centuries. The accomplishment of this possible production is one of the most fundamental general benefits that can be conferred, for through the products of the soil all persons are ultimately touched. An understanding of these fundamental facts and principles in soil management should be possessed by all persons as a basis for wise public policies. To secure, by means of local experiments, the information that will permit the correct application of these basal principles to each important type of soil in the State, should be the common purpose of the farmer and of the public institutions charged with such studies.

ADVANCED READING

The Reading-Course lessons are designed merely to introduce the subject; they are elementary and brief, and are intended to arouse a desire for more complete knowledge along particular lines. The study of Reading-Course lessons should be introductory to the study of standard agricultural books, and of bulletins of the United States Department of Agriculture and the state experiment stations. The Supervisor of the Reading-Course will suggest, as far as possible, agricultural literature to meet the needs of any reader. Particular books or bulletins are recommended because they are thought to be of special interest to the reader in his individual study, not because they are considered superior to others on the same subject. The following is a list of books in which the data presented in this lesson are much amplified and to which the student will naturally turn for more complete information:

Principles of soil fertility. By Alfred Vivian. Orange Judd Company, New York. $1.

Principles of soil management. By T. L. Lyon and E. O. Fippin. The Macmillan Company, New York. $1.75.

Soil fertility and permanent agriculture. By C. G. Hopkins. Ginn & Co., Boston. $2.25.

Fertilizers and crops. By L. L. Van Slyke. Orange Judd Company, New York. $1.

Engineering for farm drainage. By C. G. Elliott. John Wiley & Sons, New York. $1.25.

CORNELL STUDY CLUBS

Cornell study clubs are local organizations of farmers and their families, aiming to promote the study of Cornell Reading-Course lessons. One of the chief benefits of these clubs is that they furnish an opportunity and an incentive for study. Often a helpful lesson will reach a farm home at a time when the members are too busy to give it attention and it is soon forgotten. If, however, a special time is set aside for the study of Reading-Course lessons at a club, it is likely that much more reading will be accomplished. The secondary purpose of Cornell study clubs is to increase a neighborly feeling in the community and to offer an opportunity for an exchange of thought on subjects of common interest. In the meetings of a club the members should find enjoyment in an interchange of ideas and a training for free and orderly self-expression.

The organization of a Cornell study club can be easily effected even if at first only half a dozen persons desire to form a group. The president and the secretary of the club should be chosen, and the dates and places for meetings decided upon. The meetings should be held frequently enough to maintain an active interest in them; regularly every two weeks during the fall and winter is usually considered sufficiently often. If it is not advisable to meet every fortnight in spring and summer, monthly meetings are suggested. Study clubs hold their meetings in churches, grange halls, and at the homes of the members. The meetings should proceed under a definite order of business.

Each study club should first become fully informed as to the material available in the two Reading-Courses. The Reading-Course for the Farm discusses farm practices and important rural problems. The Reading-Course for the Farm Home takes up such household subjects as sanitation, foods, household management, and household furnishing. If the study club is composed of men, the lessons should be related to local agricultural conditions and should deal with operations in progress at the time of year in which they are being discussed. If the club is composed of both men and women, the lessons in the two courses may be alternated, or two separate groups may be formed, holding part of the program in common. If the club is composed of women, a number of valuable suggestions will be found in Reading-Course Lesson for the Farm Home, No. 13, *Cornell Study Clubs*. The clubs are most successful when the programs are planned carefully several weeks in advance and leaders are selected to be responsible for the success of each meeting. The supervisors of the Reading-Courses will be pleased to suggest reference books and bulletins to leaders who desire additional material for study. Reading-Course lessons should be distributed to the members of the clubs at

least one week in advance, so that the members may be prepared for a general discussion, which should follow the opening talk given by the leader.

Cornell study clubs may bring about cooperation in matters of public concern, and may grow to be influential factors in promoting community welfare. They may also prove of financial benefit by becoming agencies for cooperative buying and selling. The success of the Cornell study club must depend principally upon local leadership. It is hoped that public-spirited persons will find in the Cornell study clubs a means of improving the agricultural and social conditions in their communities. Visits from representatives of the college will be arranged when possible. Cordial cooperation in establishing study clubs may be obtained by writing to the Supervisor, Reading-Course for the Farm, or the Supervisor, Reading-Course for the Farm Home, College of Agriculture, Ithaca, New York.

Whenever desired, study clubs may be conducted in connection with the educational work of granges, churches, schools, and local agricultural societies. The following three ways are suggested in which Reading-Course lessons may prove valuable to a study club or to any other organization:

1. For study by the entire membership previous to a general discussion at a regular meeting.
2. To aid leaders in preparing for a program at a regular meeting.
3. For reference. A set of available lessons may be obtained for use by a study club or for the library of any church, school, grange, or other organizations.

Bulletins and circulars of the Cornell University Agricultural Experiment Station may also be obtained for the above purpose by writing to the Mailing Division, College of Agriculture, Ithaca, New York.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

Entered as second-class matter at the post office at Ithaca, New York

B. T. GALLOWAY, *Director* A. R. MANN, *General Editor*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

VOL. IV. No. 74 OCTOBER 15, 1914 THE SOIL SERIES No. 1 revised

INTRODUCTION TO THE PRINCIPLES OF SOIL FERTILITY

DISCUSSION PAPER

A supplement called the discussion paper is sent with each Reading-Course lesson, for the purpose of bringing out the main points covered and of calling attention to related agricultural facts, practices, or methods. The College encourages an expression of opinion or a statement of experience by means of the questions asked. Each discussion paper filled out and returned will be read carefully and a personal reply will be made if agricultural information is desired regarding personal or community problems or the subject studied.

New readers should enroll in one or more of the following series of Reading-Course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT-GROWING, FARM CROPS, STOCK-FEEDING, VEGETABLE GARDENING, PLANT-BREEDING, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, readers should sign and return this discussion paper, whether the questions are answered or not.* As an aid to students taking Reading-Courses, study clubs may be formed in various localities. References for advanced reading will be given on request. *The space below on this page is reserved for correspondence concerning Reading-Course work, and also for names and addresses of any persons likely to become interested on receipt of information.*

(In answering questions, attach additional paper if needed and number the answers.)

The following questions will call attention to the soil conditions in your home region. We should be glad to have you direct our attention to any soil conditions that you consider need special investigation, or to any practices that you consider especially successful or especially unwise as applied to your soils.

1. In what way have the soils in your region been formed?

2. What is the general character of the soil and the subsoil in your region?

3. Are the soils as productive now as when first cleared? How do you account for any change that may have occurred?

4. Are all the soils in your region being utilized in the way that will give the best permanent returns? What is the percentage of waste lands? What suggestions can you offer?

5. Name the practices that are followed in your region to maintain the productiveness of the soil. Are they applied in the proper order?

6. What crop rotation or rotations are followed in your region, and under what conditions?

7. To what extent is attention given to growing on each soil the crop to which it is best adapted, through either selection of seed or systematic plant-breeding?

8. Are fertilizers used in your region? What is their composition? On what crops are they used? Are you satisfied that the best fertilizer is being used in each case?

9. Is lime ever used on the land? Do you think its use would be beneficial in any way?

10. Point out any local or unusual methods of soil management in use in your locality.

Name..

Address...

Date..

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VOL. IV. No. 76 NOVEMBER 15, 1914 COUNTRY LIFE SERIES No. 2

BIRDS IN THEIR RELATION TO AGRICULTURE IN NEW YORK STATE

A. A. ALLEN

Enemy of army worm and locust, the bobolink

BIRDS IN THEIR RELATION TO AGRICULTURE IN NEW YORK STATE

Each year in the United States there is a loss to agriculture of more than seven hundred millions of dollars owing to the ravages of insects; our forestry and timber interests suffer to an extent of over one hundred millions of dollars. Each year the people of New York State pay a toll of over ten million dollars to the insects. And yet there are still persons who do not appreciate the value of protecting our native birds, the enemies of the insects and one of the chief factors in their control.

FIG. 10.— *The army worm*

Nor is it only because of the destruction of insects that we owe a great debt to the birds. Certain species, especially during fall and winter, feed almost entirely on the seeds of weeds; a single species, the tree sparrow, which visits New York State from October to April, probably consumes each year not less than nine hundred tons of weed seed. Again, in some parts of the State, field mice and other small rodents are causing considerable damage to grain and forage crops, and young orchards have to be protected against them. The chief enemies of these rodents are the hawks and the owls, and yet these birds are most persistently persecuted. A conservative estimate states that each hawk or owl in the State kills an average of a thousand mice a year — a saving of at least twenty dollars to the farmer whose property it selects for its residence. Thus we might go on enumerating the various ways in which birds are necessary to agriculture, until we arrived at the same conclusion as did H. W. Henshaw, Chief of the United States Biological Survey at Washington, who says that without the birds "it is more than likely — nay, it is almost certain — that within a limited time not only would successful agriculture become impossible, but the destruction of the greater part of the vegetation would follow."

It must not be assumed from this, however, that all birds are at all times *perfect* machines for the destruction of the farmer's foes and entirely beneficial in their food habits. It cannot be denied that some of the insects destroyed by birds are beneficial rather than detrimental, and that a few species of birds consume some grain, while others do damage to the smaller fruits, and to poultry. There are no birds, however, that are entirely

FRIENDS AND FOES OF AGRICULTURE

1. GREAT HORNED OWL WITH FOWL
2. COOPER'S HAWK WITH PIGEON
3. SHARP-SHINNED HAWK WITH ROBIN
4. MARSH HAWK (MALE) WITH MEADOW MOUSE
5. MARSH HAWK (FEMALE)
6. RED-TAILED HAWK WITH MEADOW MOUSE
7. RED-SHOULDERED HAWK
8. BARRED OWL WITH RAT
9. SPARROW HAWK (FEMALE) IN FLIGHT
10 SPARROW HAWK (MALE) WITH LOCUST

The first three are foes of agriculture; all of the others and the smaller species of owls (not illustrated) are friends.

detrimental, and those that do more harm than good are exceedingly few. In New York State the sharp-shinned hawk, the Cooper's hawk, the goshawk, and the great horned owl are the only birds that can be said to be uniformly more destructive than beneficial, and even these do considerable good. In restricted localities at certain periods of the year, it is doubtless true that crows and blackbirds are injurious to grain and robins are injurious to cherries; but it must be remembered that in other parts of the State, and at all other seasons of the year, these birds are highly beneficial. Nor should all the individuals of a species be judged by the actions of a few, any more than all mankind should be judged by the theft or knavery of a few. Frequently individual birds depart so far from the customary habits of the species, feeding on valuable produce of the farm, as to bring all birds of that kind into disrepute. For example, there are isolated cases of the kingbird, one of our most beneficial birds, feeding on honeybees. The owners of the bees had an economic right to dislike the birds, and if necessary to remove them, provided they first ascertained whether the kingbirds were not feeding exclusively on the superfluous drones, as has often been the case.

FIG. 11.— *The broad-winged hawk. Unjustly accused of taking chickens*

Great care should always be exercised to correctly determine the culprit, for many unfortunate mistakes are made. For example, the other day a broad-winged hawk, which had been shot by a farmer who accused it of having taken his small chickens, was brought into the laboratory.

He had seen it, he claimed, fly down into the chicken yard, and he naturally believed that it was to be blamed for the disappearance of his chickens. Inasmuch as this species of hawk has never been known to feed on poultry, the writer was inclined to doubt that the farmer had located the real thief; and an examination of the bird's stomach proved the surmise to be correct, for it contained only four large June beetles (the larvæ of which, known as white grubs, do considerable damage to the roots of strawberries and other crops) and the hair of a meadow mouse. The chickens had probably been taken by the smaller and much less conspicuous sharp-shinned hawk, which had slipped away without being seen, while the more conspicuous and highly beneficial broad-wing had paid the penalty. Another case is cited by Sylvester D. Judd in his "Birds of a Maryland Farm." In this case the catbirds, which were abundant about a certain tomato patch, were accused of pecking the ripening fruit at a time when the high price made this a considerable loss. A careful investigation, however, proved that the destruction was due entirely to a neighbor's chickens. These are but examples of the inaccurate observations being made all over the United States, which have done more than anything else to condemn wrongfully many beneficial birds.

It is this lack of knowledge that has caused many States in the past to offer bounties for the killing of certain birds, notably hawks and owls. Pennsylvania, for example, in 1885 passed an ordinance offering a bounty of fifty cents for every hawk and owl killed within the State, and in eighteen months $90,000 had been paid out in bounties. At the end of that time small rodents had so increased that the ordinance was hastily repealed. It was estimated that during the short time that it was in force, the agricultural interests in the State suffered a loss of nearly four million dollars, not to mention that of ensuing years owing to the increase of the mice caused by the destruction of the hawks and owls, their natural control. A wholesale slaughter is never to be recommended, even if the species in question has been, beyond a doubt, more detrimental than beneficial.

The following pages are intended to show in a general way the food of the various groups of birds found in New York State, and their relation to agriculture, and to encourage more careful observation and greater appreciation of the services rendered by our native birds. One thing should always be borne in mind. Within certain limitations birds are adaptable in selecting their food, and their tendency is always to take the food that is most abundant and most easily secured. Thus, while they never exterminate any insect, they tend to keep the numbers within bounds, and as soon as a particular species is greatly reduced they turn their attention to some other insect that is more abundant and more easily secured. In this way they serve as valves, or regulators, on the

increase of insects, especially because by their freedom of flight they are quickly mobilized to points where food suddenly becomes abundant —as happened this year by the outbreak of grasshoppers and army worms.

Another example of this occurred in Utah in 1848, when the Mormon settlers were saved from actual starvation by the thousands of gulls that flocked to their fields to feed on the hordes of crickets which had completely destroyed their first year's crops and were fast consuming the planting of the second year. In describing the advent of the gulls, an eyewitness, Honorable Geo. Q. Cannon, says: " Black crickets came down by millions and destroyed our grain crops; promising fields of wheat in the morning were by evening as smooth as a man's hand,—devoured by crickets. . . . At this juncture sea gulls came by hundreds and thousands, and before the crops were entirely destroyed these gulls destroyed the insects, so that our fields were entirely freed from them. . ." It was regarded by some of the settlers as a heaven-sent miracle, and in the past year (1913) an elaborate monument and fountain were erected in Salt Lake City " to the gulls that saved the settlers from starvation."

Similar services were rendered by birds during the locust invasions following the settlement of the Mississippi valley, when all birds, large and small, fell to feeding on grasshoppers. The value of the birds in saving the crops was evidenced in letters written by farmers in answer to questions sent them regarding the work of the birds. The following is quoted verbatim:

> Dear Sir.—In answer to your question about birds and locusts, I must say this: every farmer that shoots birds must be a fool. I had wheat this last spring on new breaking. The grasshoppers came out apparently as thick as the wheat itself, and indeed much thicker. I gave up the field for lost. Just then great numbers of plover came, and flocks of blackbirds and some quail, and commenced feeding upon this field. They cleaned out the locusts so well that I had at least three fourths of a crop, and I know that without the birds I would not have had any. I know other farmers whose wheat was saved in the same way.
>
> S. E. Goodmore
>
> Fremont, Nebraska.

In this connection the quantity of food that birds can eat is convincing. Few persons realize how much food birds require in order to maintain their ordinary activities. The bird's temperature is much higher than that of man, and its life processes go on with correspondingly increased rapidity. It requires but thirty minutes for some foods to pass entirely through a bird's alimentary canal, and all foods are assimilated and the residue excreted within two and one half hours. Since birds in a natural state eat continuously, we can consider the quantity eaten as the equivalent of about eight full meals every day. In the work of the Biological Survey at Washington to determine the economic value of the different species of birds, many thousands of birds' stomachs have been examined. Fre-

quently stomachs have been so packed with insects that when opened the contents have made a pile much larger than the original size of the stomach. For example, the stomach of one yellow-billed cuckoo contained 250 tent caterpillers, that of a nighthawk 500 mosquitoes, that of a cedar waxwing (cherry bird) 100 cankerworms. The crop and stomach of a red-winged blackbird were found to contain 1800 seeds of ragweed, that of a bobwhite 5000 seeds of pigeon grass, and that of a mourning dove 9200 seeds of pigeon grass. These figures represent single meals of the birds in question,

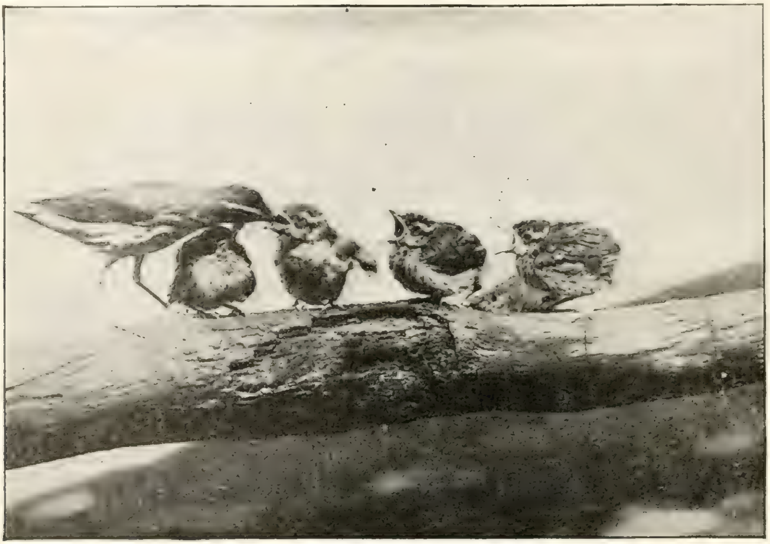

FIG. 12.—"*Young birds require even more food than old birds.*" *Louisiana water thrush feeding its young*

probably consumed where the food was very abundant, as it is in the case of insect outbreaks or where weeds have become troublesome. Observations made in the field are no less convincing, and corroborate the laboratory studies. We find recorded a scarlet tanager which devoured 630 gypsy moth caterpillars in 18 minutes—a rate of 2100 in an hour. A Maryland yellow-throat consumed 3500 plant lice in 40 minutes—a rate of 5250 in an hour.

Young birds require even more food than do old birds, as any one who has watched young birds being fed in the nest will testify. The quantity of food that they require increases with their age, reaching a maximum at about the time they leave the nest. Many nests have been watched by persons interested, and the number of times that the young were fed recorded. A family of young martins was fed 312 times in a single day,

grosbeaks were fed 426 times, and wrens 600 times. Experiments have been performed with young crows in order to determine the exact amount of food required by them in maintaining strength and growth, and it has been discovered that they lose weight unless given food equal to one half their own weight every day. Young robins have been known to eat their full weight of earthworms in a day.

When we stop to consider these facts we begin to realize what efficient machines the birds are for the destruction of insects. They maintain a natural balance and check the undue increase of any species. But they work so quietly that few persons realize their value until for one reason or another their control is suddenly removed, and some insect pest, such as the grasshoppers and army worms during the current year, spreads over the land. Much more conspicuous is the damage that a few individuals occasionally do in the poultry yard or in the cherry orchard. The news of such a loss from birds becomes greatly exaggerated, and overrides completely the really tremendous saving that the birds have more quietly brought about.

FOOD HABITS OF BIRDS

From the fishes that dart through the streams, and the grubs that burrow in the soil, to the insects that flit over the top of the forest, there is scarcely a plant or an animal substance that does not furnish the food of some group of birds. The water plants and mollusks that grow at the bottom of the lake are not safe from ducks; fishes are pursued through the dark waters by loons and grebes, or speared from above by herons and kingfishers; the grubs and worms in the soil are probed for by the snipe and the woodcock, or seized when they come to the surface by blackbirds and thrushes; the cutworms and beetles that crawl on the ground are caught by larks and sparrows; the insects that mount into the bushes and trees are seized by the hosts of smaller vireos and warblers, while those that hide within the trunks and branches are drilled out by the woodpeckers. If they have wings they are pursued by the flycatchers and swallows, so that none of them are safe. It would obviously be impossible to treat thoroughly, in these few pages, all the varied foods of birds, nor is it necessary if we bear in mind our need of all kinds of birds to hold in check the great variety of foes that the agriculturist has to meet. Rather will we outline the various groups of birds according to their food, and emphasize only those that have the most immediate bearing on agriculture in New York State.

The general nature of a bird's food can frequently be determined by the general structure of the bird itself. The varied proportions of wing and body, the size and shape of bill and feet, which in addition to their colors give birds their great variety, are due largely to the differences in their food and in their methods of securing it.

In the first place we can divide all birds into two groups: those that feed on animal substance, and those that feed on vegetable substance. Of the animal feeders we have those that feed on other birds and on small mammals, those that feed on fish, frogs, crayfish, and the like, and those that feed on insects and worms. Let us first consider the bird and mammal eaters — the hawks, the owls, and the shrikes.

Bird and mammal eaters

The hawks and the owls are alike in possessing strong, sharp talons for seizing their prey, and strong hooked bills for tearing it apart. The hawks have keen sight and hunt by day. The owls hunt by night, and, although they have very large eyes, locate their prey more by sound, for they have very keen hearing. Small birds and poultry, being silent at night, are seldom molested by owls; but rats and mice, being active, are taken in large numbers. In addition to birds and mammals, a large part of the food of hawks and owls is composed of the larger insects, such as grasshoppers, crickets, and June beetles. In fact, it was found by Dr. A. K. Fisher, of the United States Department of Agriculture, in studying over two thousand stomachs of hawks and owls taken in all parts of the United States, that 27 per cent of the birds had fed on insects while only $3\frac{1}{4}$ per cent had eaten poultry or game.

FIG. 13.— *Marsh hawk about to alight*

Hawks

Thirteen species of hawks are found more or less regularly in New York State; but three of these—the goshawk, the pigeon hawk, and the duck hawk are too rare to be of great importance. All the hawks vary so much in size and in coloration with both age and sex that it is difficult to describe any species in a few words, but four types are recognized in addition to the bald eagle and the osprey, or fish hawk.

Harriers.—The first of these types, the harriers, includes only the marsh hawk, a long-winged, long-tailed hawk with a conspicuous white patch above its tail. It is like the owls in having a facial disk of short feathers,

and very well-developed ears. The ears undoubtedly assist the bird in following its prey, consisting largely of mice, through the long grass of the fields and marshes which it inhabits. In addition to mice, the marsh hawk feeds on snakes, frogs, insects, and small birds. Occasionally it takes young chickens or small ducks; but of 124 stomachs examined by Dr. Fisher, only 7 showed any sign of having taken poultry. This is therefore a highly beneficial species, deserving of protection.

Broad-winged or fan-tailed hawks.—The second type includes the red-shouldered, red-tailed, rough-legged, and broad-winged species. They are alike in possessing broad, rounded wings, and broad, comparatively short tails which they usually spread in a fan-like manner while soaring. They are the most conspicuous of all the hawks, being often seen soaring in great circles overhead. Because of their conspicuousness they have had to suffer for all the crimes of their more crafty relatives, and are frequently known as hen hawks or chicken hawks. As a matter of fact they seldom, if ever, visit the poultry yard, and the few times that they do are more than offset by the numbers of obnoxious rodents that they destroy. Of 105 stomachs of the rough-legged and broad-winged species examined, not one contained poultry; of 782 of the red-tailed and red-shouldered hawks, only 57 contained poultry or game birds.

FIG. 14.—*Immature red-shouldered hawk, a beneficial species*

Falcons.—The third type has rather heavy shoulders, short, pointed wings, and narrow tail. In this type are included the duck hawk, the pigeon hawk, and the sparrow hawk, but the last named is the only one of sufficiently general occurrence to have great importance in the State. It is common in most parts of the State about the borders of woods and pas-

tures, usually nesting in a deserted flicker's hole high up in a dead stub. The duck hawk and the pigeon hawk, when they do occur, frequently destroy many pigeons, but the sparrow hawk feeds mostly on the larger insects, meadow mice, and the smaller birds. Of 320 stomachs examined by the Department of Agriculture, not one contained poultry, 215 contained insects, 89 contained mice, and 53 contained small birds.

Short-winged hawks, or Accipiters.—The fourth group contains the real poultry thieves. These birds have short, rounded wings and long, narrow tails. Three species are found in the State, but the largest, the goshawk, is rare. Of the other two species, the Cooper's hawk is the larger, the females sometimes measuring nearly twenty inches in length, although the males are barely sixteen inches long. The largest (female) sharp-shinned hawks never measure over fourteen inches, and the males measure less than twelve. Both species are much alike in coloration, immature birds being brown above and white below with longitudinal streaks of dark brown. Old birds are slaty gray above and below white, heavily barred with brown. In addition to its larger size, the Cooper's hawk differs from the sharp-shinned in having a rounded tail, that of the sharp-shinned being square.

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FIG. 15.— *The sparrow hawk with house sparrow*

Both birds frequent woodlands rather than open country, and are seldom seen soaring high in the air. They dart through the thickets or skim low over the ground in search of their prey, or come to rest on a low branch of a tree. The sharp-shinned hawk, because of its small size, attacks mostly the smaller chickens, but the Cooper's hawk is able to carry off nearly full-grown fowls. Because of their elusive ways, a poultry owner may often hear commotion in the poultry yard and miss many a fine fowl before he gets even a glimpse of the culprit; and many an innocent, but more conspicuous, hawk of the broad-winged species has come

to an ignominious end by the gun of a well-meaning but uninformed hunter or poultryman.

About their nesting grounds both species are noisy, scolding from a safe distance at any intruder. The sharp-shinned hawk always nests in a thick evergreen; the Cooper's hawk nests indiscriminately in pines or hardwoods, usually within fifteen or twenty feet of the ground but occasionally in the tree tops. Both birds sometimes remodel the nests of crows or squirrels, and usually use a few green leaves or evergreen twigs for lining. The Cooper's hawk begins to nest the last of April, but the sharp-shinned hawk usually waits until the first of June. The

Fig. 16.— *A litter of young field mice*

eggs of the former are nearly pure white; those of the latter are very heavily spotted with brown. As with other hawks, the period of incubation is long and the young develop slowly, so that it is between two or three months from the time the eggs are laid until the young leave the nest. The young are at first covered with white down, and resemble small chickens. They are unsuspicious and lack the fierce natures of their parents until their feathers begin to grow. Taken while very young they can be tamed, some having been used as are the true falcons in hunting small game.

Owls

In general it may be stated that, with the exception of the great horned owl, the owls are among the most beneficial birds of the State; and the

great horned owl, in spite of its poultry-thieving habits, is not without its value because of the numbers of rabbits, rats, and mice that it destroys. The value of owls is best appreciated in nursery districts, where losses of thousands of dollars have been entailed by mice and rabbits girdling the young trees in winter. In some places it is imperative to wrap the young trees in tarred paper or otherwise protect them from the ravages of these small rodents.

At times when conditions for their growth and reproduction have been advantageous for several years, great plagues of these mice have occurred,

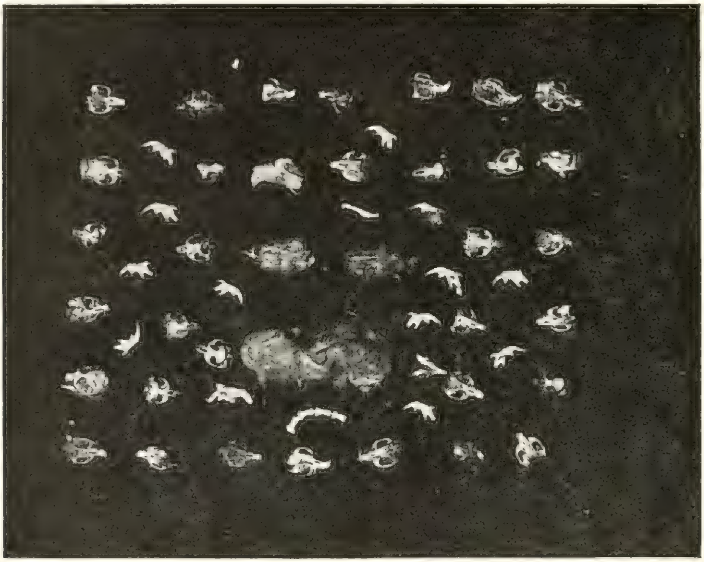

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FIG. 17.—*Owl pellets and skulls of mice removed from them*

the entire country being overrun with them. Indeed, considering their reproductive capacity it seems remarkable that plagues do not occur more often. The common field mouse has five to eight young at a litter, and four or five litters in a year. Allowing for only thirty young in a year from each pair, in five years the offspring from a single pair would number over two million. Such valuable aid as the owls render in keeping down this increase should therefore never be overlooked, even though it goes on so inconspicuously.

At times, however, their aid is very conspicuous. We find recorded in many of the European chronicles, great flights of owls following the plagues of voles, attracting the attention of every one and finally so reducing the numbers of the voles that they were no longer obnoxious.

The number of mice destroyed by a single one of these birds will speak for itself to any one who will search the ground beneath a tree where one of the birds is known to roost habitually, for the owls swallow their prey whole when it is not too large, and later throw up the bones, hair, and other indigestible parts in the form of pellets. By soaking these in water the skulls of several mice can usually be teased out of every pellet, speaking strongly for the value of these birds and the need of protecting them.

There are six species of owls found regularly throughout New York State, two others occasionally, and one more very rarely. The great horned and the barred owl (colored plate) are the largest, being nearly two feet in length and thus exceeding the crow in size; the long-eared and the short-eared owl are next in size, being about fifteen inches in length; and the screech owl and the saw-whet owl are the smallest, being less than ten inches in length. The great horned, long-eared, and screech owls have tufts of feathers on their heads, resembling horns. These are absent from the barred owl and the saw-whet owl. The great horned owl, which is the only one that should ever be killed, is easily distinguished by its large size, conspicuous "horns," and white throat patch. As many individuals never visit the poultry yard and are of considerable value in reducing the number of obnoxious rodents, even this species should not be killed unless it takes up its abode near the poultry yard. The great horned owl nests in late February or early March, laying two or three white eggs in a hollow tree or in an old crow's nest.

Fig. 18.— *Nest and eggs of great horned owl, a rat and a bird in storage*

The shrikes, or butcher birds

The shrikes resemble the hawks only in the form of the bill, which has become hooked for tearing flesh. They are still primarily insectivorous

birds, however, feeding to a large extent on grasshoppers and crickets, and have come to a carnivorous diet only secondarily, feeding to some extent on small birds and field mice. They have the curious habit of impaling their superfluous food on thorns or on barbs of fences; and since they do not have strong talons, like the hawks, they drive their prey, if too large to manage with the bill, into the fork of a limb where they can tear it apart.

Two species are found in New York State, the northern shrike in winter

PHOTOGRAPHED BY G. A. BAILEY

FIG. 19.— *Migrant shrikes at their nest in a thorn bush*

and the migrant shrike in summer — the latter nesting in thorn bushes or similar places rather commonly in the western part of the State. The birds of both species are gray, with black wings and tail and black band through the eye. The northern species is somewhat the larger, and slightly exceeds the robin in length.

Shrikes are usually seen perched on a dead or exposed branch, in the open country or about bushy pastures. They do not go in search of their prey as do most birds, but await its coming to them, having very

keen sight which enables them to see grasshoppers or meadow mice at a considerable distance. These they destroy in much greater numbers than they do small birds, and they are therefore deserving of protection and encouragement. They build bulky nests of sticks, straws, and wool, usually in thorn bushes, and lay five to seven grayish eggs spotted with brown.

Fish, frog, and crayfish eaters

Fish, frogs, crayfish, and similar forms are food for many of our most striking and interesting birds. The fish taken are largely of the non-commercial varieties, such as minnows and suckers; although occasionally about fish hatcheries and trout ponds these birds are said to do considerable damage to the trout fry. Careful investigation should be made, however, before condemning them, for the secretive habits and active dispositions of the trout preclude their frequent capture as long as there are the conspicuous minnows and sluggish suckers to provide an easier forage.

FIG. 20.— *Green heron near nest in the alders*

This group of birds can be further subdivided according to their methods of capturing their prey. There are the herons and the bitterns, which stalk their prey and spear it with their javelin-like bills; there are the fish hawks, the kingfishers, and the terns, which watch the water from on high and plunge like animated spears from above; and there are the loons, the grebes, and the mergansers, which pursue the fish beneath the water.

The stalkers

In this group are included the great blue heron (incorrectly called the crane), the black-crowned night heron, the little green heron, the bittern, and the least bittern. They have long legs for wading and long toes to keep

them from sinking into the mud, long necks to enable them to reach the water without stooping, and long, javelin-like bills for spearing their prey. The edges of their bills are very sharp and in some cases have minute serrations, which enable them to cut through the slime and to hold their slippery game. The bitterns keep to the marshes, where their streaked brown plumage so harmonizes with the cat-tails and the sedges as to make them very inconspicuous. The herons are seen along the shores of lakes, streams, and ponds, either silently waiting until some luckless fish comes their way or gracefully stalking through the shallow water in search of frogs and crayfish. So much do they add to the landscape, and so valueless are the few species of fish that they destroy, that it is little short of criminal to kill them unless it has been absolutely determined that they are destroying valuable trout fry.

In flight herons stretch their feet out behind and throw their heads back on their shoulders. The great blue heron in flight appears larger than an eagle, measuring more than six feet across. The green heron is about the size of a crow, even resembling it in flight. At close range it appears blue rather than green, as the green is restricted to the wings while the back and the shoulders are bluish gray. The neck and the underparts are chestnut.

The night heron is larger than a crow. The adult birds are pure white below and pearl gray above, the upper back and the top of the head being black. Immature birds closely resemble the bittern. They are nocturnal in their feeding habits, usually seen toward dusk or early in the morning.

The plungers

These include the fish hawk, or osprey, the kingfisher, and the terns. The fish hawk, unlike the others of this group, seizes its prey in its talons, which have been modified from those of other hawks so that two toes are directed forward and two backward; and the soles of its feet are covered with sharp, horny scales to help in holding the slippery fish. It frequently catches fish weighing several pounds, but they are always of a species that swims close to the surface or lies in the shallows. As few of the fresh-water commercial fishes except the pikes have this habit, the depredations by the fish hawks are not great — as is evidenced by the fact that fishermen are their best friends, always welcoming their appearance in the spring. Their only enemy save the bald eagle, which frequently pursues them and steals their well-earned catch, is the thoughtless man with a gun.

The kingfisher is common along every stream and lake shore in the State, occasionally staying all winter about streams that do not freeze. It is possible that along trout streams this bird sometimes catches trout fry, but the bulk of evidence points toward its feeding on the non-commer-

cial minnows and suckers. At any rate, as long as there is no good evidence against it, the kingfisher's striking appearance and interesting habits make it deserving of protection. In catching fish the kingfisher either waits on a dead branch overhanging the water until a fish passes beneath, or hovers over the spot where a fish is seen, and at the proper instant plunges abruptly downward, spearing the fish with its strong, pointed bill, the force of its impact sometimes carrying it entirely beneath the surface.

The terns are largely maritime in their habits, although a few species are occasionally seen about the larger bodies of water throughout the State. They have been called sea swallows because of their long, pointed wings, their usually forked tails, and their graceful flight. Their bills are strong and pointed, however, and most species feed entirely on fish, which they catch by plunging like the kingfisher. The black tern is less maritime than the other species, sometimes nesting about some of the more extensive marshes in the State, and being not uncommon along lake shores in the fall. In summer the head and the underparts are black, and the back and the wings are slaty gray; but during the fall the black is replaced by white. During the summer the bird feeds on insects as well as fish, but during the remainder of the year it restricts itself largely to the smaller fishes, such as minnows and killifish, which travel in schools. The common tern and the least tern also are occasionally common about the larger bodies of water during spring and fall, and nest on some of the islands in Lake Erie. It is very doubtful that they do any appreciable harm, as they also feed on small fish that are of no commercial value. They are nearly pure white in color, with pearl-gray wings and black caps.

Fig. 21.— *Kingfisher with small sucker, a non-commercial fish*

The divers

This group includes the grebes, the loons, and the mergansers — duck-like birds which secure their fish by diving and pursuing them beneath

the water. The grebes, or hell-divers, are about the size of small ducks, with short wings, pointed bills, and lobed feet attached at the posterior end of the body. The bills are not so strong nor so sharply pointed as those of the preceding groups, or as those of the loon, for the grebes feed also on aquatic insects and water plants.

The loon is about the size of a small goose, black, speckled with white above, with webbed feet and a strong, pointed bill.

FIG. 22.— *The pie-billed grebe, a diver*

The mergansers are species of ducks that have developed very narrow, fluted bills for a diet largely of fish.

As with the other fish eaters, the economic value of these birds is not very appreciable. So long as they are not detrimental, however, they should be protected and encouraged. It should not be required that their value be reckoned in dollars and cents, when they add so much interest and life to the out of-doors.

The scavengers

One group of fish-eating birds remains to be considered — the scavengers. These include the various species of sea gulls, of which the herring gull is most common, the bald eagle, and at times the crows and the grackles. The food of these birds is dead and dying fish, and they render a service to humanity and to the health of communities living near large bodies of water by removing the carrion. When pressed by hunger the gulls leave the lakes and feed about city garbage dumps and similar places, and they regularly feed about ploughed fields, where they are undoubtedly very beneficial in eating insects and grubs. Mention was made in the introductory paragraphs of the value of the gulls in Utah, at the time of its settlement by the Mormons, in saving them from actual starvation. They are certainly among our most beneficial birds.

In spite of its apparent power, the bald eagle, which is used as our national emblem, feeds almost entirely on dead fish cast up by the waves or stolen from the fish hawks.

Crows and grackles are also fond of dead fish, and sometimes congregate along lake shores in large numbers. They even fly out over the lake in search of fish floating at the surface.

Insect eaters

Just as we recognize among the fish-eating birds several groups according to their method of securing their food, so can we divide the insect eaters

FIG. 23. — *Herring gulls and crows feeding on garbage within the city of Ithaca. Both are efficient scavengers*

into strainers, probers, scratchers, borers, flycatchers, and gleaners, according to their respective methods of securing their food.

The strainers

These include ducks, geese, and swans — birds having broad, flat bills with fluted edges, to permit the water and silt to pass out while the insects, worms, and mollusks are retained.

Two groups of ducks are recognized — the river or pond ducks, and the sea ducks. The former group includes the mallard, black duck, gadwall, baldpate (or widgeon), green-winged teal, blue-winged teal, shoveler, pintail, and wood duck. They secure their food chiefly by dabbling in the shallow water, diving only as occasion demands. The second group includes the redhead, the canvasback, the greater and lesser scaup ducks (or bluebills), the ring-necked ducks, the scoters, and the curious little

ruddy duck. These species secure their food by diving, frequently in water one hundred and fifty feet deep, which fact forces them to remain beneath the surface for minutes at a time. Their food consists chiefly of small clams, snails, crayfish, shrimps, and the seeds and roots of aquatic plants. Their greatest value lies, not in the nature of their food, but in supplying food and sport for the hunting population. While spring shooting was allowed in many States, so that the strong breeding stock that had survived the winter was largely depleted each year, the number of our wild

FIG. 24.— *Wild ducks (bluebills) coming to be fed, within the city of Ithaca*

ducks very rapidly diminished until some species were on the verge of extinction. Since the stopping of spring shooting, however, their number has gradually increased; and now that the uniform laws of the United States Department of Agriculture have been passed, it is hoped that these birds will soon regain their own, and once more be common on all our lakes and streams.

In former years many species nested in New York State, and breeding birds with their families of ducklings were not uncommon sights about our lakes and marshes. Most of these have been killed, however, and, as no effort has been made to encourage others to remain, most of them go farther north to breed. There is no reason why our numerous marshes

should not be made to yield an ever-increasing supply of wild ducks, and wide areas that are at present valueless, to give some return to the people of the State. Some effort will have to be made at first in order to establish the breeding birds; for, even though conditions be made very favorable, it will take many years for the birds to become established, because all birds tend to return to the place of their birth and most of the ducks have been hatched farther north. If, however, a breeding race should become established in New York State, the same homing instinct would tend to insure their returning to the people of the State rather than going elsewhere.

Few persons watching the flocks of wild ducks as they wing their way southward, or drift about the middle of our lakes out of reach of the hundreds of gunners who pursue them, realize that they are wild and wary only because they have been shot at until they look on man only as their enemy. Few persons know that when the hunting season closes and the birds find it safe to venture near the shores and the abodes of man, they become nearly as tame and unsuspicious as domestic fowls. The accompanying photograph shows a flock of wild ducks (bluebills) in a creek within the city of Ithaca, which swam *toward* people approaching, rather than away from them, because they had been kindly treated and fed when their natural food supply was scarce. If these ducks could be encouraged to nest in New York State, how much they would add to our lakes and streams, as well as to the table and the enjoyment of the sportsman!

FIG. 25.— *The yellowlegs, a prober*

The probers

In this group are found the snipe, the woodcock, the sandpipers, and the plovers — birds with long, slender bills, with which they probe in the soft mud or between the stones of the beach for insects, mollusks, and crustaceans. The snipe and the woodcock have the longest bills, the plovers have the shortest; the last named not probing for their food so much as do the others.

These birds are found along shores, wet meadows, or, in the case of the woodcock, moist woods. Few species nest in New York State, but on

their migrations, especially during the fall, they throng our lake shores and mud flats. Many of the larger species, such as the yellowlegs, black-bellied and golden plovers, Wilson's snipe, and woodcock, are game birds. The spotted sandpiper and the killdeer are the only two that nest abundantly in New York State; two others, the Bartramian sandpiper, or upland plover, and the woodcock, were formerly abundant, but have been nearly exterminated in most places by excessive shooting. The Wilson's snipe occasionally nests in extensive grassy marshes. The spotted sandpiper keeps to the lake shores and margins of streams, and feeds entirely on insects such as gnats, mosquitoes, caddis flies, and May flies, and their larvæ. The killdeer and the upland plover feed more on the upland fields, and destroy quantities of grasshoppers, army worms, crickets, weevils, white grubs, and the like. All species feed so much on insects which are annoying to man or which destroy his crops, that they are without question deserving of the protection and encouragement which the present laws give them.

The scratchers

These include the birds with strong legs and toes, similar to those of the domestic fowl. Their food is secured largely by scratching, but it includes also insects that run over the ground or live on the lower vegetation, as well as acorns, beechnuts, grain, and weed seed. The ruffed grouse, the bobwhite, and the pheasant belong to this group. While they are of service to mankind in destroying potato beetles, grasshoppers, army worms, cutworms, and weevils, their greatest value is their preeminence as game birds. The numbers of both grouse and bobwhites, but especially the latter (or quail, as they are commonly called), has been greatly depleted throughout the State. Both species respond well to artificial propagation, but little has been done in this State to restore their numbers. It is to be hoped that in the near future steps will be taken to restock our woods and fields with our native game birds, as well as to introduce the pheasant, which has responded so well to artificial propagation.

The borers

In this group are all the woodpeckers, birds highly specialized for climbing the trunks and branches of trees and drilling for wood-boring insects. Their feet, with two toes directed forward and two backward, act as pincers in grasping the bark. Their tail feathers are stiffened and serve as a prop to support them, relieving their legs from the weight of the body. Their bills are large, strong, and tipped with a chisel-like edge for chipping the wood, and their tongues are extremely long, spear-like, and barbed for removing the larvæ from their burrows. The downy and the hairy

woodpeckers, both of black and white streaked plumage, are the commonest in New York State. The flicker, our only brown woodpecker, has departed so far from the habits of the remainder of the family that it frequently descends to the ground and feeds on grubs and ants, which it finds by probing in the soil or in ants' nests. The red-headed woodpecker is common in some parts of the State, especially in the southern and western parts, and the red-bellied woodpecker is more rarely found in the same territory.

All the woodpeckers are among our most valuable birds, because they destroy the wood-boring insects, which are very difficult to combat in any other way. Every effort should be made to encourage and protect them. A very simple method of attracting them to the orchard or to trees about the house is by hanging pieces of suet or beef scraps on the trees, especially during the winter months. This is discussed under "How to attract birds," page 49. The birds will more than pay for the small trouble, not only by their interesting habits, but also by searching the neighboring trees very thoroughly for boring larvæ or pupæ concealed beneath loose bark.

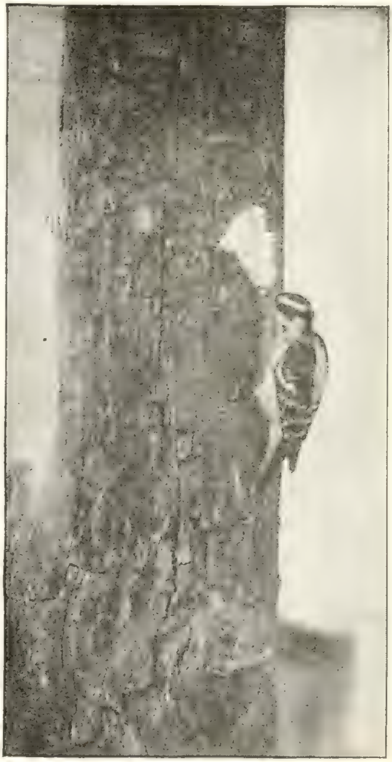

FIG. 26.—*The hairy woodpecker, a borer*

Slingerland and Crosby, in their "Manual of Fruit Insects," state concerning the codling moth: "Its most effective natural enemies are the birds, over a dozen species of which are known to feed on it. The downy woodpecker, nuthatch, and chickadee destroy great numbers of the hibernating larvæ, under loose flakes of bark. In fact, it requires diligent search to find larvæ towards spring even where empty cocoons are abundant. Usually a tell-tale hole through the bark flake into the cocoon explains the absence of its occupant. These birds are such efficient aids to man in controlling the codlin-moth that they should be carefully protected. During the winter they feed in small flocks, going over the same territory day after day, carefully examining every portion of the bark for insect food. They may be induced to visit an orchard regularly

by tying strips of beef fat to a few of the branches and the destruction of the codlin-moth larvæ will more than pay for the trouble involved."

It is true that during a few weeks in summer the red-headed woodpecker because of its fondness for fruit, sometimes does some damage in cherry orchards; but it should be borne in mind that throughout the rest of the year it is an extremely beneficial bird. The yellow-bellied sapsucker, on the other hand, has departed from the usual habits of the family, getting a large part of its food from the sap of trees, which it taps with its sharp bill. The little round holes, close together in horizontal rows, frequently almost girdle the tree and considerably weaken it. It has been estimated that a loss of more than a million dollars is suffered every year in the United States by the blemishes caused by this bird to hickory, oak, cypress, and yellow poplar timber. It attacks many kinds of trees, including most of the fruit trees, and is said sometimes to become drunk or stupefied from imbibing fermented sap. It feeds its young on wood-boring larvæ, and is therefore partially beneficial.

FIG. 27.— *Yellow-bellied sapsucker at work*

The flycatchers

In addition to the birds usually spoken of as flycatchers, this group includes many other birds, some of which are much more highly specialized for a fly-catching habit than are the true flycatchers. Notable among these in New York State are the nighthawk and the whippoorwill, the chimney swift, and the six species of swallows — the barn, cliff, tree, bank, and rough-winged swallows, and the large purple martin. They are all birds of strong flight, and have long, pointed wings, and extremely wide mouths for the capture of insects, which they seize while on the wing. Since they are entirely insectivorous they are highly beneficial, and every means of protecting them and of attracting them about the farm should be employed.

In some places nighthawks are still shot by thoughtless persons, merely because they make good targets as they fly over the pasture. This practice is of course highly to be condemned and is punishable by law. From the stomach of one nighthawk 60 grasshoppers were taken, and from another 500 mosquitoes.

The various species of swallows, also, are among our most beneficial birds, but unfortunately they have shown decrease in recent years. The purple martin, for example, is very rare in most parts of the State; but by the erection of bird houses for it to nest in, it could easily be encouraged to become one of our common birds. The martins nest in colonies. Houses for their nesting should contain many compartments, each opening to the outside. The house should be mounted on a pole at least fifteen feet from the ground, or on a shorter pole on top of a building. Houses for tree swallows should be single, like bluebirds' boxes, with an opening about two inches in diameter toward the top of one side. They should be placed on a pole in an open space in the yard, or on an open side of the house below an upper window. The decrease in numbers of barn swallows is largely accounted for by the construction of the modern barns, with no openings for the entrance of the birds. Owners of such barns should make the proper openings beneath the gable, for the swallows are one of the most valuable natural assets of the farm. The bank swallows nest in colonies in sandy banks, especially where large excavations have been made. There is no very satisfactory means of increasing their numbers, nor the numbers of the rough-winged swallows which associate with them, except by giving them the protection that they so much deserve.

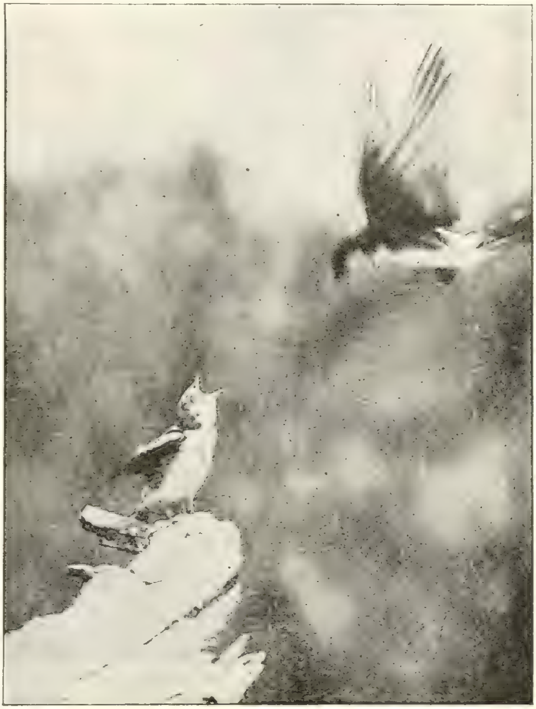

Fig. 28.—*Tree swallow, a fly-catching bird, teaching its young to capture insects on the wing*

Of the true flycatchers, the kingbird, phœbe, wood pewee, and least flycatcher are the most abundant and the best known. The crested flycatcher is less common, but it will sometimes nest in a box put up for a bluebird and makes a most acceptable substitute. The phœbe makes a nest of mud and moss beneath a bridge, about barns, or over windows, and is much to be desired. It is well to nail ledges in various places about the house or the barn, to supply the birds with available nesting sites. These ledges should be placed less than a foot below some projecting eave or ledge which will protect the nest from the rains. The wood pewee nests on a horizontal limb in the orchard, making a neat little nest covered with lichens. The kingbird builds a more bulky structure toward the end of a branch. The kingbird gets its name from its habit of driving away hawks — for which alone it is desirable, not to mention its value in destroying injurious insects. It has been accused in some places of destroying honeybees, but an examination of 634 stomachs by the Department of Agriculture showed that only 22 contained honeybees and five sixths of these bees were drones. The kingbird is therefore deserving of the greatest protection.

PHOTOGRAPHED BY G. A. BAILEY

FIG. 29.— *A successful martin house*

The chimney swift originally nested in hollow trees of the forest, but, with the disappearance of these and the erection of chimneys, it has taken kindly to the unused chimneys and, since it has few enemies, has probably greatly increased in numbers. It is entirely insectivorous and highly beneficial, destroying countless numbers of gnats and mosquitoes.

The gleaners

This group includes the largest number of our common birds — those that run about on the ground in woods and fields, and those that creep

about the branches of trees or flutter about the outermost twigs, gleaning insects and their larvæ from their numerous hiding places. Leaves, twigs, branches, bark, the grasses of the fields, and the leaves of the forest floor, are all carefully scrutinized. Where these birds are abundant, insect pests are few. As there are more than one hundred species included under this head, we must content ourselves with taking up only the major groups.

Fig. 30.— *The phœbe, a flycatcher*

First, there are the *ground gleaners*, including crows, larks, blackbirds, bobolinks, meadow larks, finches, and thrushes, all of which are birds of medium size and generalized structure. In addition to feeding on insects, most species feed also on seeds, especially during spring and fall. Their bills are finely pointed and sharply edged for holding the insects, as well as strong and heavy for cracking seeds. Because of this seed-eating habit, crows and blackbirds sometimes gain the enmity of farmers; and, while there are undoubtedly instances of their doing considerable damage to newly planted corn or to ripening grain, such instances are comparatively few and are more than balanced by their beneficial habits of destroying injurious insects and weed seed.

Fig. 31.— *Female red-winged blackbird. This bird feeds largely on the ground and is one of the ground gleaners, an enemy of cutworms, army worms, and locusts*

Secondly, there are the *leaf gleaners*, birds that search over branches

and leaves for the innumerable insects that feed there. In this group are included the brightly colored, energetic little warblers, feeding on aphids and young caterpillars; the somewhat larger and more slowly moving vireos; the tanagers, orioles, cuckoos, wrens, and kinglets; and some of the ground gleaners that habitually spend part of their time in the trees The birds in this group are of small or medium size, with small, sharply pointed bills for picking even the most minute insect eggs. They come to us with the bursting of the leaves in spring, when they are most needed, and leave again in the fall as the leaves begin to turn. It is needless to say they are deserving of protection, for they are of inestimable value.

A third and smaller group includes the *bark gleaners*, birds that find their food by prying about the crevices in the bark of the trunk and larger branches of a tree, where many insects conceal their eggs or crawl away to hibernate. Under this head are included the two nuthatches—the common white-breasted and the more migratory red-breasted species—the black and white creeper (a warbler), the brown creeper and the chickadee. All these birds are highly beneficial, and, with the exception of the black and white creeper, are easily attracted to the house and garden by pieces of suet, as was suggested for the woodpeckers.

FIG. 32.—*Chickadee, a leaf and bark gleaner, and a friend of the farmer*

Vegetable feeders

Of the vegetable feeders, the seed eaters form the largest class. Their food includes also small fruits, buds, soft shoots, or even leaves, and one species, the humming bird, derives a large part of its food from the nectar of flowers.

The seed eaters

This group includes many of the ground gleaners such as sparrows, blackbirds, larks, and crows, together with a few specialized forms such

as the crossbills, which live almost entirely on seeds. As a rule the birds in this group have rather generalized wings and feet, and heavy bills for crushing seeds or removing hard outer seed coats.

By far the greater part of the food of these birds consists of the seeds of weeds, which fact makes the birds highly beneficial; and when one considers also the fact that most species feed to a large extent on insects during the summer, and feed their young entirely on insects, their true value will be better realized. Unfortunately some species find the cultivated grains as much to their taste as the weed seeds, but complaints to this effect are local and can usually be easily remedied. The crows and the blackbirds, for example, which sometimes feed on cultivated grain, are wary and suspicious birds, and, while this makes them more difficult to shoot, they are for the same reason more easily frightened away. The old-fashioned scarecrow still proves very efficient, provided it is not left too long in one place. If left for many days in the same spot, it becomes but a part of the landscape to the crows and they do not mind it. If, however, it is moved about they remain suspicious of it. The same is true of strings stretched about the field with pieces of fluttering paper or rag attached. They work well for a time, but should be changed as soon as the crows show signs of getting used to them. Another method of preserving the corn is to soak it in creosote or coal tar before planting. This does not effect its

PHOTOGRAPHED BY C. R. CROSBY

FIG. 33.— *Where gleaners are necessary. A cherry tree denuded by tent caterpillars. Orioles are fond of the young caterpillars; cuckoos devour them even after they become large and hairy*

germinating properties, but the crows will not eat it. A little waste grain scattered about the edge of the field will sometimes preserve all that has been planted. Occasionally there will be found a few crows so wise that none of these ruses will keep them from the cornfield, but these birds are so wary that the mere discharge of a gun in their direction is sufficient to keep them from the field for all time. The gun should be reserved for these occasions only, and it should always be remembered that crows are at most times highly beneficial birds.

FIG. 34.— *The tree sparrow, a seed eater, on an anti-sparrow food shelf*

Blackbirds are a little more difficult to deal with, but fortunately their depredations in New York State are less common. They attack the ripening corn while it is still "in the milk," or the grain after it is in the shock. No very satisfactory way of combating them has yet been discovered except by the noise of a gun. The sound is as effective as the shot in scaring them away, and the fewer that are killed, the bet er; for, like the crows, they are very beneficial at other times of the year.

The fruit eaters

There are but few of the larger birds that do not eat fruit in its season. As it ripens it forms a bounteous food supply, taking the place of the insects, the supply of which has then begun to wane. Most of the larger gleaners, including crows, blackbirds, waxwings, orioles, thrashers, catbirds, and thrushes, and some of the sparrows; the flicker and the red-headed woodpecker among the borers; the grouse and the bobwhite among the scratchers; and even some of the larger flycatchers, such as the kingbird — these turn their attention to the ripening fruits. Fortunately most species confine their attacks to wild fruits, and it is probable that all species prefer the wild varieties to the cultivated fruits when the former are available. Unfortunately the wild fruits are seldom, if ever, available about cherry orchards, and, as a result, many complaints are registered against the birds. Proper attention has never been given to the planting of wild fruits about the edges of orchards to lure birds from the more valuable fruit. Where it has been tried it has proved very successful. The fruit tree usually planted is the Russian mulberry, which ripens its fruit at the same time as the early sweet cherry. As the birds prefer its fruit to cherries, it proves an efficient protection.

Firearms should not be resorted to except as a last measure; for, while they may be effective in protecting the ripening fruit, they deprive the orchard of one of its most valuable allies at other seasons of the year. There are certified instances of orchards to which birds have been attracted, that have been saved from the ravages of the insects despoiling neighboring orchards. In case resort is made to the gun, it will be just as effective to save the shot and let the sound frighten the birds away.

Only two small groups remain to be considered—the *nectar eaters*, including among our New York State birds only the ruby-throated humming bird; and the *leaf and bud eaters*, including the ruffed grouse and the purple finch. The latter do not destroy enough buds of fruit trees to be obnoxious, and are highly beneficial in their other food habits.

FIG. 35.— *The male house (English) sparrow*

GENERAL DISCUSSION OF ECONOMIC VALUE OF BIRDS

In general it may be stated that the birds of New York State, as a whole, are highly beneficial to the various agricultural interests of the people; a few are rather negative in their importance, and a very few are detrimental. Of the last-named, the sharp-shinned hawk, the Cooper's hawk, and the great horned owl are so destructive to poultry that it is desirable to kill them; but poultrymen should learn to distinguish between them and the other hawks and owls, so that the real culprit will always be the one taken. The yellow-bellied sapsucker is detrimental to orchard and shade trees, and to the timber of forest trees. In most parts of New York State, however, its depredations are restricted to a comparative short interval in spring and fall, and no great damage is done. Crows, blackbirds, and fruit eaters such as the robin and the waxwing, are highly beneficial during

most of the year, and should not be killed until competent examination has proved that there is no other remedy for their stealing the grain and fruit.

There remains to be mentioned the problem of the house (English) sparrow, which in many localities is highly obnoxious, not only because of its grain-eating habit and its fondness for fruit, peas, beans, and other vegetables, but also because it crowds out the more beneficial birds and usurps their nest holes. It is undoubtedly highly desirable that the numbers of house sparrows should be greatly diminished. Shooting is *not* recommended because after the first few shots the birds become extremely wary, and, besides, the sound frightens away other birds. Poisoning is dangerous, and usually results in the death of many native birds as well, if in nothing worse. There remains only the method of trapping, which if properly carried out proves very successful. Readers are referred to Farmers' Bulletins Nos. 383 and 493 for diagrams, and methods of using traps. These bulletins can be obtained on request by writing to the Secretary of Agriculture at Washington, D. C. In using the traps they should not be left too long in one place; for after a number of sparrows have been caught, the others grow suspicious.

FIG. 36.—"*Fasten pieces of suet to the branches and trunks of trees,*" *and thus protect your orchard. An appreciative downy woodpecker*

Inasmuch as our birds are so beneficial, every effort should be expended to protect them, encourage them, and attract them about the orchard and garden. In the following paragraphs is offered a suggestive outline for some of the simpler methods of increasing the numbers of native birds about the farm.

The simplest way to a bird's heart is through its stomach. Every one must realize the difficulty which birds, especially those that are courageous enough to brave the cold winter months, have in finding sufficient food to keep themselves alive and warm. Wherever they find an abundant

food supply they linger much longer than where food is scarce; and, while it is easier to attract the winter birds when food of all kinds is scarce, it is also possible to attract many birds at all seasons of the year.

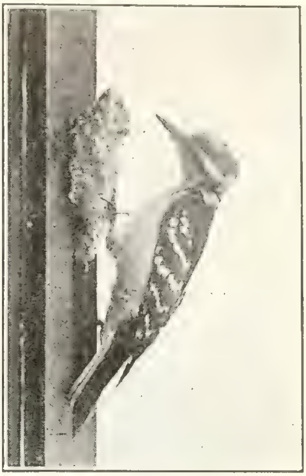

Fig. 37.— *A hairy woodpecker on the window casing*

Our winter birds are of two kinds — those that feed on insect larvæ, pupæ, and eggs, which they find in the crevices of bark or drill for in the trunks and branches of trees; and those that feed on seeds and fruits. The former include, among our common birds, the chickadee, nuthatch, downy woodpecker, hairy woodpecker, brown creeper, flicker, and the red-headed and red-bellied woodpeckers in southern parts of the State. The latter include the junco, tree sparrow, horned lark, redpoll, pine and evening grosbeaks, pine siskin, and song sparrow. It is comparatively easy to attract many of these birds about the house and even to a feeding shelf at the window, while chickadees and nuthatches often become so tame that they will feed out of one's hand.

HOW TO ATTRACT BIRDS

Let us suppose that you wish to have a merry troop of bird visitors passing to and from your dining-room window, where you can watch them during the breakfast and the noon hour; that you wish sometimes to open the window and have a confiding chickadee fly in and pick crumbs from the table. Do not expect the birds to come immediately to the window. Begin this fall, or as soon as you read these lines, to fasten pieces of suet, beef fat, or pork rind to the branches and trunks of the trees. The more pieces you put up and the farther from the house you extend the supply, the sooner they will be found by the birds. The quickest returns are brought by fastening the pieces of meat in trees in radiating directions from the window to which you want the birds eventually to come. Then, as soon as one piece of suet is found, the bird that finds it will fly from that piece to another, and so on until it finds the one at the window. This last piece may be fastened to the window casing, or preferably to an evergreen branch fastened to one side of the window.

As soon as a bird finds a piece of suet it will return again and again, and other birds, seeing this bird, will do likewise, until a whole flock frequents the trees about the house. It is then time to remove the pieces that are

farther from the house, and cease replenishing any but the one at the window. Soon all the birds will be coming to that one.

Now, suppose you wish to have some of the seed eaters — a flock of juncos and tree sparrows, for example — feeding at the window. If the window ledge is wide, it will be sufficient to nail a cleat along the outer edge in order to keep the seed from blowing off. But a wider shelf will be more satisfactory, as it gives the birds more room, none but the house sparrows being willing to be crowded while they are eating. This shelf can be made the full length of the window, or smaller; but the larger it is, the more satisfactory it will be. At one end of the shelf should be fastened a small Christmas tree or evergreen branch, to break the wind,

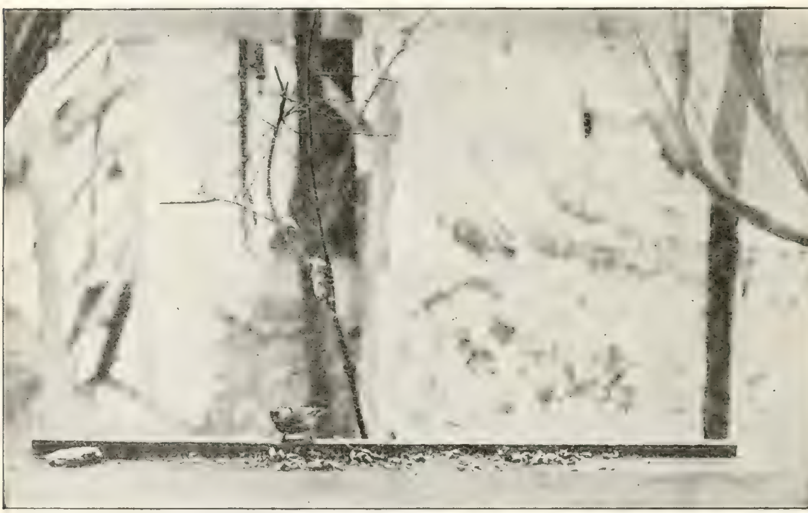

FIG. 38.— *The simplest form of window feeding-shelf and a nuthatch visitor*

and to give the birds a place into which they may retreat when frightened. It may be sufficient merely to place the proper food on the shelf in order to attract these other birds, for they often travel in company with the chickadees and nuthatches. But if there are no bushes near the house to afford them shelter, they will probably hesitate to fly long distances through the open in order to get to the window. In case there is no natural shelter near the house, artificial brush piles should be made, as by leaning together the lima bean poles with the vines attached. This has been called " the bird's tepee," and it affords shelter during the winter snows. It is always well to include evergreen branches in it, so as to keep the snow from sifting through and filling all the open spaces below. Beneath this " tepee " or brush pile, food should be scattered similar to that on the shelf.

The cheapest food to use is cracked grain, such as is fed to young chicks; but hemp and millet are preferable if available. Another food, which is chosen before all others by chickadees and nuthatches as well as by juncos and tree sparrows, is crumbs of raw peanuts. Bread, cake, and doughnut crumbs, or bread crumbs soaked in grease, are also good bird food. For the cardinal where it occurs and for the grosbeaks, sunflower seed is the best, and this is relished by other species as well. The writer detained a flock of evening grosbeaks at his feeding station for over a month after their usual time of departure for the Northwest by keeping them bountifully supplied with sunflower seed. A row of sunflowers about the border of the garden, and a small patch of millet in one corner will easily supply all the seed necessary, and will likewise attract some of the summer birds. Goldfinches, for example, one of our most beautiful birds, will throng to a garden where sunflowers are planted, pulling seeds from the flowers as fast as they ripen. If the sunflowers are left standing, the goldfinches will continue to visit the garden all through the fall and winter, even after they have exchanged their bright summer plumage for the duller garb of winter. The patch of millet will detain the migrating birds and direct them toward the feeding station.

Fig. 39.— *Goldfinches will be attracted by sunflowers*

Many other plants, shrubs, and trees are attractive to birds either because of their fruits or because of the shelter that they afford. A little observation in the field will show the species about which the birds congregate, and these should be planted about the garden. Among the most conspicuous of these and the ones best adapted for planting may be mentioned the various species of evergreen cone-bearing trees, chokecherries, shadbush, mountain ash, hawthorn (or thorn apple), mulberry, osiers, sumacs, elders, Virginia creeper, nightshade, and wild grape. Most of these lend themselves to very attractive planting about the house and garden.

These are the simplest ways of attracting birds. It is surprising with

what readiness they respond to a little kindness and how tame they soon become. They show no fear of a person sitting by the window if the window is down, and soon lose their nervousness even when it is open, sometimes even feeding from one's hand.

Care should always be exercised not to leave the window open if there is a cat in the house, for the temptation to jump at the birds on the shelf would be too great for any cat to resist, and that would do more than anything else to frighten the birds and stop their coming. For the cat is the greatest enemy of the birds. More birds are destroyed annually by cats, says our eminent naturalist, John Burroughs, than by all their other enemies put together. E. N. Forbush, the State Ornithologist of Massachusetts, estimates that in that State alone cats kill more than seven hundred thousand birds every year. As a result the birds have come instinctively to recognize the cat as their enemy, and are not easily attracted nor will they become tame where cats are kept. The stray or underfed cat is of course the worst, and it should be considered a crime to turn a cat adrift on the neighborhood, as is often done by persons moving away or tiring of caring for their pets. Pet cats should always be severely punished whenever they catch birds or break up nests, and many of them can be broken of the habit.

FIG. 40.— *Another simple form of feeding shelf. Chickadee waiting for junco to finish*

If one is willing to expend a little more labor in his desire to watch the birds, a more elaborate form of feeding shelf is the window box. Here the shelf is placed on the inside of the window and enclosed with glass, forming a sort of glass box projecting into the room. This has the advantage

of being protected from the weather, and the birds while feeding are always inside the house, lending a very friendly atmosphere.

Another form of feeding shelf, and one that can be used in conjunction with the window shelf, is that here illustrated (page 1810), placed on a pole about five feet from the ground. It is made of the top of a barrel, the hood being formed of parts of the hoops and covered with canvas or other heavy cloth. The object of the hood, which should cover a little more than half of the shelf, is to protect the food from the weather so that it will be available when most needed without the necessity of brushing away the snow.

Fig. 41.— *The anti-sparrow food shelf at an upstairs window*

If house sparrows prove obnoxious on the shelf, they can be eliminated by hinging the shelf to the window sill and holding it in place with strings from the corners tied to a light spring which in turn is fastened to the window frame. When a bird alights on this kind of shelf, the shelf bobs up and down. Our native birds, which are accustomed to feeding about the branches of trees, do not mind this; but the house sparrow is naturally so suspicious that he probably fears some trap when the shelf gives way beneath his weight, and immediately flies away, not stopping to investigate.

So much for the winter birds. If the supply of food is kept up during the spring, many of the migrating birds will come with no further trouble. White-throated, white-crowned, song, and chipping sparrows, blackbirds,

robins, cowbirds, catbirds, thrashers, towhees, and even scarlet tanagers, can be attracted in this way. The last named birds, however, prefer a shelf stocked with cake and doughnut crumbs not so near the window.

The regular summer birds find plenty of natural insect food and do not respond so readily to feeding. The woodpeckers, however, will continue to visit the suet all through the summer, and will even bring their young.

Although most of the summer birds do not respond to feeding, some of them are easily attracted about the home by placing nest boxes in the trees or on the house. There are many firms that manufacture these boxes, building them in the form of miniature houses, hollowed limbs, and the like; but any one with a knife and a hammer can make boxes acceptable to the birds.* The wren here illustrated deserted a somewhat elaborate box fastened in a tree, for this rather crude one fastened to one of the posts on the porch within arm's reach of the door. Boxes of this general form are entirely satisfactory. The opening should be made on one side toward the top, not at the bottom. For wrens this opening should be an inch and a half in diameter (the size of a half dollar); for bluebirds, tree swallows, and crested flycatchers, about two inches; and for flickers and screech owls, larger proportionately. Purple martins nest in colonies, and for them only, more than one compartment should be built in the box. A large house made of a barrel or half a barrel, capped with a conical tin roof and divided into sixteen or more compartments, is quite as satisfactory to the martins as the more elaborate boxes made in imitation of dwellings. The openings should be about two inches in diameter.

FIG. 42.—*House wren building nest in box provided*

* Detailed directions for building nesting boxes can be found in *Bird Houses and How to Build Them*, Farmers' Bulletin 609, United States Department of Agriculture, Washington, D. C.

The size of any nesting box should vary with the size of the opening and of the bird for which it is intended. The one here illustrated has about the correct proportions. An empty chalk box has the right proportions for a wren house, and makes a good one if somewhat reinforced with wires or small nails.

The interesting ways of any of these hole-nesting birds will more than repay the small effort expended in building the box, not to mention the value of having the whole bird family raised on the insects that are preying on the garden. There are numerous cases on record of farmers who have raised perfect fruit in an infested country without the use of sprays,

FIG. 43.— *A friendly chickadee*

through the protection of a colony of purple martins and other birds attracted to the orchard.

Another method of attracting the summer birds is by supplying them with water for drinking and bathing. Birds are always more abundant along streams or about springs, where water is available. If there is no natural supply, artificial fountains or baths will prove very attractive to many species. If more elaborate provision seems impracticable, a shallow tray — the larger the better — with water one or two inches deep will serve the purpose quite as well.

CONCLUSION

We have now considered the relation of birds to agriculture in New York State, and have found that with very few exceptions they are of inesti-

mable value in suppressing the ravages of insects and rodents and in destroying the seeds of weeds. Much as we have dwelt on this, it should not be thought that this is their only value, their only place in nature, their only excuse for living. The greatest value of birds lies not in the number of insects that they destroy, great as that is, but in the beauty and interest that they bring into human life. The study of birds, more than any other pursuit, gives one a healthy interest in the out-of-doors and provides a never-failing resource — a resource which if attained in childhood grows only richer with maturity, and forms one of the few links between childhood and old age. One should learn to know the birds and should teach his children to know them.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

Entered as second-class matter at the post office at Ithaca, New York

B. T. GALLOWAY, *Director* A. R. MANN, *General Editor*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

VOL. IV. No. 76 NOVEMBER 15, 1914 COUNTRY LIFE SERIES No. 2

BIRDS IN THEIR RELATION TO AGRICULTURE IN NEW YORK STATE

DISCUSSION PAPER

A supplement called the discussion paper is sent with each Reading-Course lesson, for the purpose of bringing out the main points covered and of calling attention to related agricultural facts, practices, or methods. The College encourages an expression of opinion or a statement of experience by means of the questions asked. Each discussion paper filled out and returned will be read carefully and a personal reply will be made if agricultural information is desired regarding personal or community problems of the subject studied.

New readers should enroll in one or more of the following series of Reading-Course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT-GROWING, FARM CROPS, STOCK-FEEDING, VEGETABLE GARDENING, PLANT-BREEDING, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, readers should sign and return this discussion paper, whether the questions are answered or not.* As an aid to students taking Reading-Courses, study clubs may be formed in various localities. References for advanced reading will be given on request. *The space below on this page is reserved for correspondence concerning Reading-Course work, and also for names and addresses of any persons likely to become interested on receipt of information.*

(In answering questions, attach additional paper if needed and number the answers.)

1. Name three ways in which birds are beneficial to agriculture. Which is most important in your locality? Why?

2. Name three ways in which birds are detrimental to agriculture. Which is commonest in your locality? Why?

3. Which of the hawks and owls are beneficial and which are detrimental, and how can the various species be distinguished?

4. Are the following birds beneficial or detrimental in your locality, and why: crow, red-winged blackbird, crow blackbird, robin, waxwing (cherry bird), bobolink, oriole, red-headed woodpecker, house sparrow?

5. Do you think the same holds true in all parts of the State for each species named?

6. What is done in your locality to protect the farm from the depredations of birds? How successful is the work?

7. What is done to attract the beneficial birds? What success has been attained?

8. Name three birds with which you are familiar belonging to each of the following groups: bird and mammal eaters, fish eaters, scavengers, probers, borers, flycatchers, gleaners, seed eaters, fruit eaters.

9. Which birds would you consider most beneficial in controlling each of the following insect pests: army worms, grasshoppers, codling moths, scale insects, plant lice, tent caterpillars, cutworms, peach-tree borers?

10. What has been your experience with cats, and what suggestions have you to offer as to their control?

11. Do you believe in bird study? Why?

Name..

Address...

Date..

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VOL. IV. No. 78 DECEMBER 15, 1914 THE SOIL SERIES No. 5

LAND DRAINAGE AND SOIL EFFICIENCY

ELMER O. FIPPIN

The underdrainage of the soil in order to remove quickly the excess of free water in the pores is quite as important as the practice of those methods of tillage that collect and conserve the rainfall. In fact, the starting point in such conservation is frequently underdrainage, which aids in putting the soil in such physical condition that it shall have the maximum capacity for the storage of moisture. It also permits the roots of plants to penetrate deeply into the soil where they can readily draw upon this stored moisture.

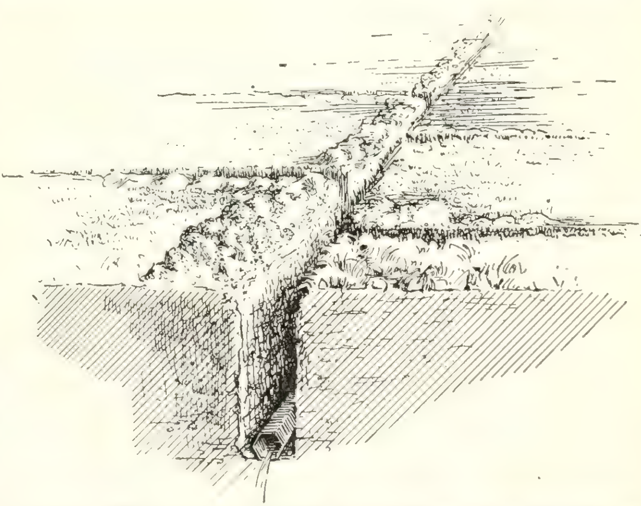

FIG. 44.—*View of system of underdrains placed at regular intervals. Adapted to land wet throughout and on which intensive cropping is to be practiced*

The necessity for reasonable drainage of the soil for the production of nearly all of the common farm and garden crops is recognized by all persons connected with agriculture. Farmers generally know that a saturated condition of the soil is unfavorable for the growth of the staple plants. As to what constitutes reasonable drainage of the soil, there is much difference of opinion. This fact is especially evident when one studies the farm land of the State in the

light of the results of modern investigation into the causes of soil fertility.

To the minds of some persons, land is well drained if its surface has a good slope. Land on the surface of which water does not stand during most of the crop season, may seem well drained. Continued saturation during the winter or protracted periods of subsoil saturation in the summer does not seem particularly objectionable to such minds.

On the other hand, the fact is that land that is intermittently wet for two or three days at a time is the cause of much greater loss to the farmer than land that is flooded the year round and is commonly known as swampy. Such land is let alone and not used for farming purposes until it is at least partially drained. On the other class of land, that which is intermittently wet, any attempt that is made to use it for tilled crops entails a loss of labor, seed, and fertilizers that cuts deeply into profits.

EXTENT OF SWAMP LAND IN NEW YORK STATE

There are about twenty-five hundred square miles of swamp land in New York State. This is distributed in many scattered areas, large and small, found in nearly every part of the State. Some of it is tidal salt marsh around New York City and on Long Island, but the greater part is in the northern parts of the State. Of this area about eight hundred square miles is composed of muck soil, and it is in this kind of land in particular that financial interests are concerned. Nearly all the soil in areas not classed as muck is dark in color, due to the accumulation of organic matter, and this soil will usually produce good crops when it is drained.

LAND THAT IS PERIODICALLY WET

The real agricultural drainage problem, however, has to do with those large areas of land which are now used for farming purposes but which are too wet to give good crop yields. It is the land that is springy and seepy; the land where fruit trees are missing, singly or in blocks; the land where corn is weak and patchy; the land where the wheat freezes out; and the land where the grass is supplanted by plantain in large, blotchy areas. A large part of the tilled area of the State falls within this class in that it needs more or less drainage. A careful study of soil types in several counties shows the proportion of such land to range from 43 per cent in Dutchess County to nearly 60 per cent in Niagara County and over 80 per cent in Livingston County. This does not mean that all this area needs systematic drainage, but rather that a considerable amount of drainage is needed in order to prevent needless waste and in order to increase net returns.

SOME TYPES OF WET LAND

Flat clay land generally needs systematic drainage. Such land occurs in large areas in the central part of the State along Lake Erie and Lake Ontario, in the Saint Lawrence valley, the Champlain valley, and the upper part of the Hudson valley as far south as Newburgh. Drainage of such soil is needed because its fine texture causes water to circulate very slowly. Moisture is likely to be retained so long that the productive capacity of the soil is reduced.

In the same regions where the clay soils occur, there are many other conditions that may produce wet soils. There are terraces of gravelly and sandy loam that are often wet along the base due to the water that has percolated down from the topsoil and that has been brought to the surface by some impervious substratum. There may be the outcrop of some porous strata through which the water moves freely, and on the hillsides this produces a seepage line or zone of wet soil. There are large rounded hills of stony loam soil that often contain wet areas. Their structure consists of glacial till interstratified with layers and pockets of gravel and sand in which water accumulates. The drumlin-shaped hills typically developed in Wayne County are of this sort. Springs and wet areas are of frequent occurrence.

Some of the most misleading soil in reference to wetness is found in the hill lands of southern New York. Much of this land has a good slope and sometimes it is almost precipitous. The slope would seem to insure good drainage, but the structure of the soil is such that good drainage does not exist. Much of the land has a moderately porous soil underlain by an impervious or hardpan subsoil. The rainfall is absorbed into this loose topsoil and trapped by the subsoil, so that it is removed only by slow percolation and by evaporation. In addition, springs are of common occurrence and spread down the slope in the form of a fan of wet soil.

Many other special types of wet soil occur, but the kinds mentioned above are those that are most frequently met. Indications of wet soil are, heaving in winter, failure of seed to germinate, bare patches or missing trees, pale green leaves, slow and stunted growth of crops, and either a black or a pale and washed-out, mottled color of the soil. The tendency of the soil to puddle and to become lumpy under tillage is further evidence of wetness.

EFFECTS OF DRAINAGE

The reasons for the importance of thorough drainage will be better understood after a consideration of the far-reaching effects of drainage on nearly all the factors of soil fertility.

1. The first effect of drainage is to remove the excess of water from the pores in the soil and to replace it with air. This means better soil ventilation. Ventilation is as essential for the roots of most plants as it is for animals. Cut off their air supply by submersion or other means, and the roots of plants soon die. Intermittent wetness does this. There is a repeated pruning of the small roots as the soil changes from a dry to a prolonged wet condition. By producing deeper drainage and better ventilation, artificial drainage promotes deeper penetration of the roots of plants.

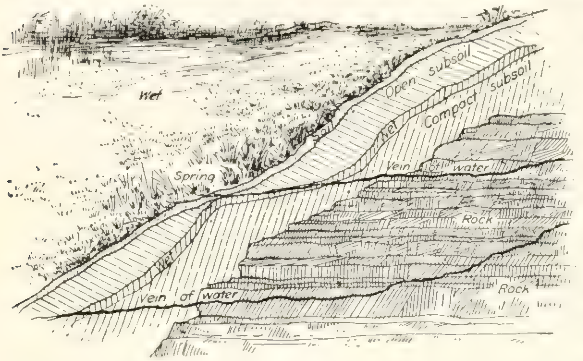

FIG. 45.—*Sectional view of soil and rock formation, showing the underground movement of water and the position of resulting wet areas on the surface. In addition to the springy places, the soil is kept wet by the seepage of water along the top of the compact subsoil. This figure also illustrates the reason for locating a cross drain above the springy area in order to effect drainage. This method cuts off the water supply*

2. The tilth of the soil is improved, and less cultivation is required in order to get the soil in condition for a crop. Drainage is the first requisite for good tilth and the efficient use of tillage implements. Not only can the land be worked sooner after each rain, but it can be worked more days in the year. Consequently a smaller equipment of tools, teams, and men is required in order to handle a given area of well-drained land than for that which is wet. The waste of energy and returns is especially large where there are wet spots. All the soil is never in condition to work at the same time, and the crop does not ripen evenly. These conditions entail increased cost and reduced returns.

3. Drainage does not remove any water that would be beneficial if it remained. It removes the standing water. On the other hand, the improvement of the tilth of the soil and the deeper penetration of plant roots make a larger amount of film water available to the crop. On drained land, crops usually stand dry weather better than those on intermittently wet land. If a person goes into a cornfield in August after a dry spell, it will be possible to pick out the wet spots in the soil by the curled leaves on the plants.

Near the surface of the soil the fluctuation in the moisture content is greatest. Deep in the soil the supply is more uniform. Consequently, the deeper the roots of a crop can maintain themselves, the more uniform is their water supply likely to be.

4. Drainage results in a higher average temperature of the soil and in a quicker warming in the spring. The difference in warmth between sandy and clay soils is due to their different capacities to hold water. Either kind of soil is cold, and slow in becoming warm, when saturated with water. A low temperature hinders the starting of seed and the growth of plants. A drained soil will probably be eight or ten degrees warmer than the same soil undrained.

5. The supply of available plant-food is increased by the better ventilation, higher temperature, deeper root penetration, better tilth, better moisture supply, and more active and favorable bacterial growth in the soil — all of which conditions result from improved drainage of a wet soil. The organisms that cause the decay of roots and manure and those that use the free nitrogen of the air are particularly affected in a beneficial way. All these benefits help to reduce the need for commercial fertilizers, thereby effecting a material saving to the farmer, which saving goes on from year to year.

6. The winter heaving of plants is largely prevented by drainage. Heaving is due to the freezing of water in a saturated soil. Water in freezing expands, and, since in the process it cannot expand in any other direction, expansion is manifested by a lifting of the surface. The frozen soil carries small plants with it. When the ground thaws the soil falls back around the roots of the plants. Each time the freezing is repeated, the heaving is increased; and on wet land in some seasons, tap-rooted plants, such as clover, may be raised to the extent of twelve or fifteen inches, and literally spewed out of the soil and left on the surface to dry up. All winter crops are particularly subject to this type of injury, which is frequently called "winterkilling." Wetness of the soil is its cause and drainage its remedy.

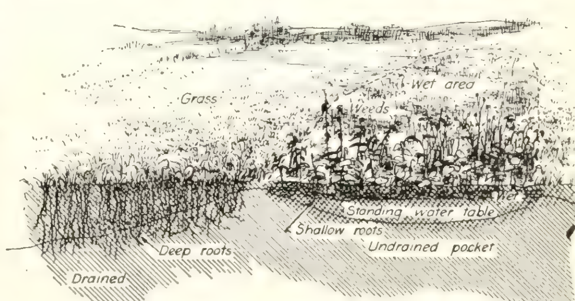

FIG. 46.— *Area of land nearly level, but having compact subsoil with undulating subsurface, thereby causing wet pockets that force plants to form short roots. Weeds are abundant in such areas. Drainage removes the water and permits deeper penetration of the plant roots, thus enlarging their feeding zone*

PURPOSE OF DRAINAGE

The object of drainage is to remove quickly from the root zone of the soil the excess of water above that which may be retained in thin films

on the soil particles, which is commonly known as capillary water.[1] Any sort of a channel that accomplishes this purpose is effective and many methods of drainage may be employed. Some are less efficient and permanent than others.

OBJECTION TO SURFACE DITCHES

Surface ditches and canals are used where temporary results are desired, or where a large volume of water must be removed. For agricultural purposes the common surface ditches, or furrows, are of low efficiency and very expensive. They do not remove the water from a sufficient depth of soil; their grade is usually poor; the water flows slowly or not at all, or, if it flows rapidly, cutting results. The earth thrown out in forming the ditch hinders the entrance and removal of water; the ditch obstructs the surface, interferes with tillage and harvesting operations, and harbors weeds. Further, such ditches must be renewed from year to year — all of which make them more expensive over a period of years than covered drains.

OLD-FASHIONED COVERED DRAINS

Poles, brush, and stone have been used in constructing covered drains and have done good service in affording drainage. Their use was much more permissible in former years than at present when a good quality of drain tile can be had in most sections of the country. All these materials have the disadvantage of short life and often high cost of construction. If stones are used they had best be arranged without any definite throat. The ditch should be relatively large. The stones should be dumped in promiscuously, except that the small, flat stones should be on the top and the bottom. The water finds its way through the large spaces, and the small stones on top reduce the danger of clogging. Flat stones may be arranged face to face, with the flat sides parallel to the walls of the ditch. The top should be covered with small, flat stones.

TILE DRAINS; THE BEST QUALITY OF TILE

The preeminent material for modern land drainage is tile. It comes in different shapes and quality. By a process of evolution we have come to prefer round or hexagonal tiles because they are easiest to lay and least likely to clog. They may be made of burned clay or of concrete. Clay tile may be either vitrified or unvitrified. The former is the more durable because its walls are less porous. The difference lies in the quality of clay used and the degree of heat applied in burning. Vitrification means partial

[1] This subject was explained in *Soil Moisture and Crop Production.* Reading-Course Lesson for the Farm, No. 70.

melting of the clay particles, which run together in a very dense mass. A low degree of porosity coincident with a moderate degree of vitrification is especially desired where the tile is likely to freeze. In the soil the pores in the tile become filled with water, and if it freezes in this condition the walls of the tile may be fractured and broken up into scales. If even one or two tiles in a long line are thus destroyed, the service of the drain is jeopardized. Since vitrified tile cost no more on the average than soft tile, there is no excuse for taking the risk in using the soft tile. The drainage efficiency of the tile is not affected by the difference in the porosity of the walls, since the water enters at the joints.

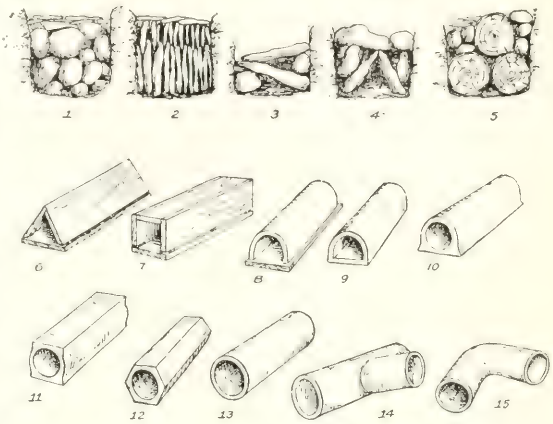

FIG. 47.— *The most common types of drainage tile and other materials used for land drainage*

1. *Cobblestones with smaller pieces of stone on top*
2. *Flat stones placed face to face and parallel to line of ditch*

3 and 4. *Throated drains constructed of flat stones used in different ways*

5. *Pole drain*
6. *Triangular box drain*
7. *Square box drain. Note construction for admission of water along lower edge*
8. *Horseshoe tile laid on a board*
9. *Horseshoe tile, bottom attached*
10. *Single sole tile with round opening*
11. *Double sole tile*
12. *Hexagonal tile*
13. *Round tile*
14. *Y-shaped junction piece*
15. *Elbow piece*

Cement tile that are of fairly good quality may be made by hand or in machines. It is doubtful whether they can be made as durable as the best clay tile. They should be carefully made of a rich mixture. Sand that is a little loamy improves the quality, if the mixing is thorough, as it reduces the amount of pore space. Whether cement tile can be made at prices to compete with clay tile depends on the size made and on the local situation in labor and materials for the two kinds of tile.

Only sound tile giving a true ring should be put in the ground. The ends should be reasonably square and smooth, so that a good joint can be made. This is most important when laying tile in soil of a quicksand nature. Here special precautions against clogging are necessary.

PROTECTION OF JOINTS

The upper half of the joint either should be very close, or should be covered with a strip of tar paper or burlap or a handful of thick cement mortar. This will force the water to enter from the under side of the joint. In heavy clay soil a very close joint is not desirable, and openings to an eighth of an inch in width are permissible, especially if the upper part of the joint is protected, as indicated above. Collars and bell-shaped ends, like those on sewer tile, are not necessary, although the latter may be serviceable in soil inclined to afford a soft bottom on which the tile rests. Such construction will protect the alignment.

ARRANGEMENT OF DRAINS

The arrangement of the drains, of course, will always depend on the structure of the soil and the slope of the land, a factor that determines the direction of movement of the water. The aim should be to intercept the flow of the water and to remove it from the land by the shortest practicable course.

On flat land the drains must be arranged generally in more or less parallel lines at such intervals as will accommodate the soil. Their purpose is to remove the water derived from rainfall on that area. In clay land they may be forty to sixty feet apart for the common field crops. On sandy soil that is moderately porous they may be eighty to one hundred and fifty feet apart. For intensive cultivation, as in growing truck crops, a greater frequency may be justified. Where the surface is undulating and where there are strata more porous than others, so that the surface or the underground water is concentrated, the drain should be located only after careful study, in order to determine the way in which the water moves. Much land that is undulating is particularly wet only in the low places, and a line or two of tile through these places will suffice. Sometimes surface water from a hillside accumulates at the foot of the slope and spreads out over the low land. In that case there should be a drain near the foot of the slope. If there is seepage from the hillside, the drain should be cut near the upper edge of the wet soil and should be deep enough, if possible, to let the tile be laid on the impervious substratum and thereby intercept the flow. Whether the drains shall be laid across the slope or down the slope depends much on the local conditions. In many cases an arrangement diagonally across the slope at a high angle is best, for it combines many of the advantages of both the other arrangements.

Clearly defined springs should be tapped by the most direct route. If the water seeps out of a considerable area of ground around the spring, Y-shaped spur drains may be helpful.

DEPTH OF DRAINS

The depth of drains will range from about twenty inches to three and a half or four feet. The commonest depth is two to three feet. In sandy land the drains may be placed deeper than in clay land. Up to a depth of four feet an increase in the depth of the drain will permit an increase in the interval between drains of about two rods for each foot in depth. In clay land an increase in the depth of laying the tile will usually not permit an increase in the interval between the drains.

GRADE

Drains must always have some grade in order to insure the flow of water. If the direction or extent of the natural grade is questionable, a leveling instrument should be used in order to determine the conditions. Often a homemade instrument, using a carpenter's level, is very serviceable.

A very small grade will suffice for the flow of water in a tile. Tile drains will operate on a grade of a half inch per hundred feet, but a fall of six inches to a foot per hundred feet is much more desirable. The less the fall, the more careful all the construction must be in order to insure permanency. Relatively larger tile must be used also. In soils of a quicksand nature it is important that the lateral drains should have no greater grade than the main, or that silt wells be constructed at intervals in order to collect the sediment and permit its removal.

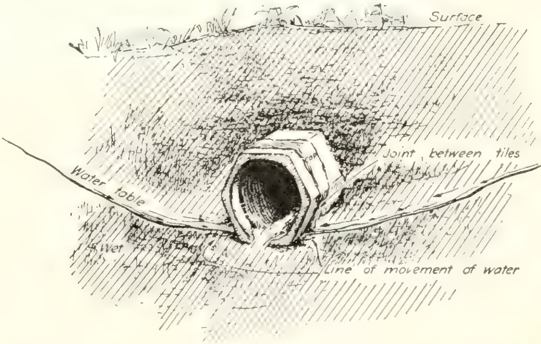

FIG. 48.—*Section across tile drain at joint, showing the entrance of water at the bottom of the joint, the protection by burlap on top of the joint to keep out silt, and the shape of the surface of the water table in a drained field, a short time after it had been in operation following a rain. The water table, or zone of saturated soil, rises between the tile*

SILT WELLS

A silt well is a pit in the course of the drain, the bottom of which extends two or three feet below the line of tile. The water comes in at one side and goes out at the other. Any coarse material will settle at the bottom. One or two sections of sewer tile placed on end with junction connections make the most simple and permanent construction. Surface water may be admitted to advantage through the silt wells, thereby protecting the system of drains from surface wash.

SIZE OF TILE

The size of tile will, of course, vary with the area drained, and with the grade and presence of surface and underground courses. The tendency of the day is to increase rather than decrease the minimum size of the tile used. From the minimum size the tile will increase in size according to the extent of the system. It is now not uncommon for tile as large as two feet in diameter to be used. Three-inch tile in lines not more than six hundred feet long are usually best for lateral drains. For drains up to fifteen hundred feet in length, four-inch tile may be used, provided the grade is not less than four inches per hundred feet. It is difficult to make an exact statement concerning the proper size of main drains. In general they should be capable of removing one fourth of an inch of water from the drainage area in twenty-four hours. Treatises on drainage give tables and formulæ by which these relations may be calculated. An increase in the grade increases the rate of flow of water. Doubling the grade increases the carrying capacity of the drain about one third. The following figures give some idea of the area of land drained by some common sizes of tile when laid at different grades:

NUMBER OF ACRES FROM WHICH ONE FOURTH INCH OF WATER WILL BE REMOVED IN TWENTY-FOUR HOURS BY OUTLET TILE DRAINS OF DIFFERENT DIAMETERS AND DIFFERENT LENGTHS WITH DIFFERENT GRADES

Diameter of tile in inches	Grade in inches per 100 feet									
	1		2		3		6		9	
	Length of drain in feet									
	1,000	2,000	1,000	2,000	1,000	2,000	1,000	2,000	1,000	2,000
	Acres of land drained by different sizes of tile									
5	19.1	15.7	22.1	19.4	25.1	22.7	32.0	30.3	37.7	36.3
6	29.9	24.8	34.8	30.5	39.6	35.9	30.5	47.8	59.4	57.3
7	44.1	36.4	31.1	44.8	58.0	52.8	74.0	70.1	87.1	84.1
8	61.4	50.7	71.2	62.6	80.9	73.6	103.3	98.0	121.4	117.3
9	82.2	68.1	95.3	83.8	108.4	89.6	138.1	131.3	162.6	157.1
10	106.7	88.5	123.9	108.9	140.6	128.1	179.2	170.5	211.1	204.4

ANGLE OF JUNCTION

Drains should join at an acute angle rather than at a right angle. In other words, the union of two lines of tile should have the Y rather than the T form, in order to prevent the accumulation of sediment where the two streams of water come together. If the arrangement of the laterals is at right angles to the main, the laterals may be curved in the last rod of their course. The union should be made at the center of

the main, so that the water from the lateral will have a slight drop. The grade of the last few feet of the lateral drain may need to be increased in order to secure this construction. It is a good plan to use junction tile that have the proper size of connection. For example, a 10-inch by 4-inch junction means a ten-inch tile that is cut to receive a four-inch lateral. If the junction is made by cutting the tile by hand with a trowel, the union should be well bedded in cement, after first laying around the tile a single layer of paper in order to prevent the cement from running into the tile.

CONSTRUCTION OF TRENCHES

Short ditches may be dug by hand, using spade, pick, and shovel. The lack of adequate help often makes it difficult to get extensive drainage systems constructed in this way. The use of horse and machine powers reduces the difficulty of construction somewhat. If the land is very stony or full of roots, hand labor must be employed, perhaps with the use of dynamite. On land that is not too stony, the ditching plow drawn by one or more teams is very helpful. There are on the market a number of plows that are very useful for this purpose. Next in complexity is the large ditching plow equipped with wheels and drawn by several teams. This plow tears up the soil and elevates it out of the ditch. There are two or three machines of this type, such as the Cyclone and the Bennett. Finally, there are the large engine-driven ditching tractors, including the Buckeye, the Austin, and the Pawling machines, which cost upward of twenty-five hundred dollars.

The large plow is suitable for the individual farmer who has a considerable area to drain and has the horses for other purposes. The tractor ditcher costs so much that it is seldom a single farm is large enough to justify its purchase. It may be purchased conjointly by a number of farmers who have drains to be constructed, or it may be purchased by one person and the ditches may be dug by contract. Machines of this kind have been put into several communities for this purpose.

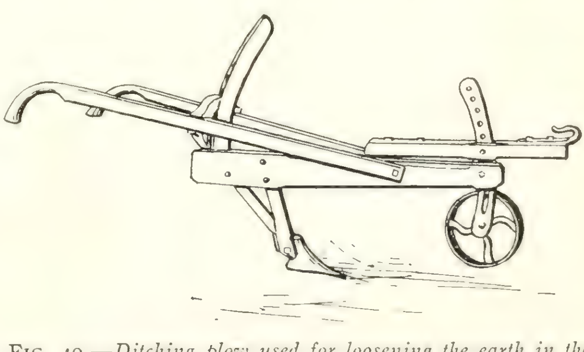

FIG. 49.—*Ditching plow used for loosening the earth in the bottom of the ditch. A number of patterns of plows of this type are on the market. The handles and the hitch are usually adjustable, in order to suit the depth of the trench. The plow is drawn by two or more horses, attached to a long evener so that they travel on either side of the trench*

For tile drains the ditches are usually dug twelve to fifteen inches wide, according to depth, and with vertical sides in order to minimize the amount of earth moved. The bottom is finished with a compact surface and a small lateral curvature, in order to afford a good base for the tile.

LAYING THE TILE

The tile are best laid by hand by a person in the ditch, who should work backward and place each tile firmly in position, and if necessary wedge it a little with pebbles or earth in order to hold it in place. Where the ditch is deep and narrow, a hook is sometimes used to place the tile.

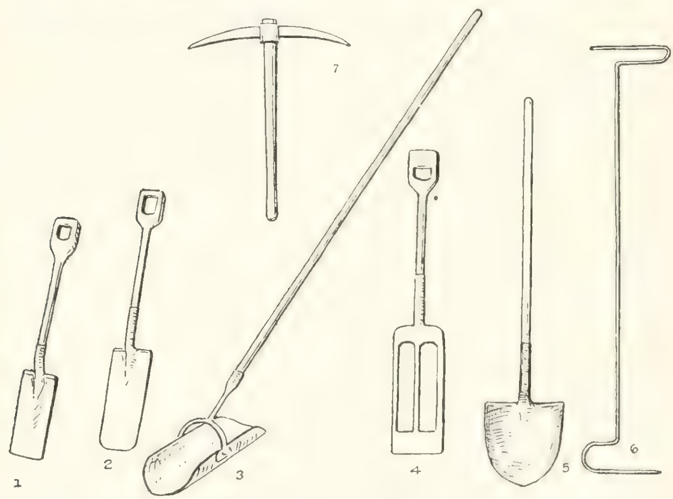

FIG. 50.—*Tools for ditching*

1 and 2. *Ditching spades for removing the major part of the earth from the ditch*
3. *Grading scoop used to finish the bottom of the ditch and the grade*
4. *Skeleton spade adapted for use in very plastic soil*
5. *Shovel for removing crumbs and loose earth*
6. *Hook used to place tile in deep, narrow trenches*
7. *Pick for loosening stone and hard earth*

BLINDING THE TILE

As soon as the tile are laid they should be lightly covered with earth, which process is known as back filling, or blinding. The sides of the ditch may be trimmed off with a sharp spade. This should be done carefully, as should also the tramping, in order to avoid pushing the tile out of line. As soon as the tile are covered three or four inches deep, one may proceed to fill the ditch roughly, using shovels, a team hitched to a plow with a long evener, or a horse and a dump scraper. On long lines of ditch the filling is sometimes done with a road scraper.

ENTRANCE OF ROOTS INTO TILE

The tile is sometimes clogged by the development of roots that gain entrance through the joints of the tile. The depth at which the tile are laid has very little to do with this difficulty. It is determined by the presence of a perpetual flow of water in the tile from some spring. In dry periods this water seeps from the joints and moistens the soil, which condition attracts the roots. Protection of the upper half of the joint against the admission of silt is some aid in preventing the entrance of roots into the tile.

CONSTRUCTION OF OUTLETS

The construction of a drainage system should begin at the outlet and end at the same place. There must be a sufficient grade to dispose of the water at the outlet. After the remainder of the system is constructed, the outlet should be carefully protected, especially if the grade is slight. This part of the system is especially in danger of being closed by tramping, caving of banks, freezing, growth of roots, and other obstructive processes. If possible the water should have a free drop from the end of the tile. It is usually advisable to build up an abutment of concrete or stone, with an apron on which the water may fall without cutting out the bottom of the ditch.

In laying out the ditch as few outlets should be provided as practicable. Where several laterals might empty into an open ditch, it is often better to drop back a couple of rods from the open ditch and put in a submain to receive all these laterals. This arrangement gives one outlet, instead of several, to be finished and cared for from year to year.

COST OF DRAINAGE

The cost of drainage varies greatly, depending on the nature of the soil, the presence of stones and roots, the depth, the size of tile, the season when the work is done, the method of construction, and the local labor conditions. For 3- or 4-inch tile the cost of the finished ditch per rod in soil not particularly foul with stone and roots is 60 to 90 cents per rod. On a system of 2560 rods constructed by hand where the size of tile ranged from 3 to 10 inches, the average cost per rod including all charges was 68 cents. Systems aggregating 8308 rods were constructed under the same management and on the same farm by using a traction ditching machine. The size of tile ranged from 3 to 13 inches, and the average cost was 63 cents per rod. Some of the work done with the machine was more difficult than any done by hand. The range in the cost of tile per rod was 17.5 cents to 94.5 cents. The average cost of trenching with the machine was 17 cents per rod. The cost of drainage on this farm was $29.74 to

$43.80 per acre. The soil was a clay loam containing a few stones. A large part of the drains were arranged systematically.

In New York State much of the land is stony and frequently has a subsoil that exhibits hardpan properties. Such soil is more difficult to excavate, the cost per rod is higher, and the drains must be more frequent — all of which increase the cost of drainage per acre.

Where a few lines of tile are laid in wet places, the cost per acre will be less than where the drains are placed at regular intervals. The farmer had best begin by draining the wettest places, having in mind that he may wish to extend the system.

RETURNS FROM DRAINAGE

The returns from drainage are large. As a matter of fact very little land is well drained naturally. Drainage will usually increase the yield of crops. The value of such increase depends on the nature of the crop. Some special crops, such as flowers, ginseng, and certain vegetables, will quickly pay for a very frequent system of drains even as close as ten feet, if the land is naturally wet. In mixed farming and fruit-growing it is the observation of many practical farmers that the need for drainage is increasingly apparent under the usual system of cropping, and that a moderate amount of drains well placed is about the best investment that can be made on the farm. Systems of drains in land that had been tilled but that was more or less wet have usually paid for themselves in four or five years, and often in much less time.

A very considerable part of the returns from underdrainage is due to increased efficiency of the farm equipment. Since drained land quickly comes into condition to permit tillage in the spring and after rains, the farmer has more time to work the land. The seasons are made longer, and less preparation is necessary in order to get land ready for a crop, for the soil has less tendency to puddle. Further, the crop grows more uniformly and ripens at one time. Not only is the normal yield considerably increased, but the risk of loss of labor, seed, and fertilizer is much reduced. An experienced farmer has remarked that "underdrainage is the acme of good farming."

The life of a well-constructed tile drain should be measured by decades and centuries, rather than by years.

LAWS RELATIVE TO DRAINAGE

It is frequently necessary for a farmer to seek an outlet for drainage water across or on a neighbor's land. The value of land drainage to the public is being more and more recognized, and provision is being made for its installation. It is now possible for a person to require his neighbor

to let him have a right of way to a suitable outlet for drainage water. The person benefited must of course pay the cost of construction in order to secure the outlet. In these cases, where a large area of land embodied in several farms is involved, cooperative action is essential.

There are two provisions in the law of New York for the drainage of wet land for agricultural purposes. The first of these is under the Agricultural Drainage Statute, Consolidated Laws of the State of New York, chapter 15, as amended by chapter 624 of the Laws of 1910. The second provision is contained in the act establishing the State Conservation Commission, Consolidated Laws, chapter 65, article 8. The general procedure is the same under both acts, and the cost of securing the right of way and constructing the drainage ditch is assessed against the land benefited. These laws usually deal with the large outlet canals, but are applicable in securing an outlet for the drain from a single farm.

In a general way, advantage may be taken of the natural fall of the land in establishing an outlet for a drainage system, and adjoining property owners must provide for the drainage water so discharged as surface water. As yet no such obligation is recognized to apply to water collected and discharged by tile drains except as it reaches the adjoining property as surface water in a natural drainage course. There are very few cases of drainage that are not provided for in the existing drainage laws of the State.

ADVANCED READING

The Reading-Course lessons are designed merely to introduce the subject; they are elementary and brief, and are intended to arouse a desire for more complete knowledge along particular lines. The study of Reading-Course lessons should be introductory to the study of standard agricultural books, and of bulletins of the United States Department of Agriculture and the state experiment stations. The Supervisor of the Reading-Course will suggest, as far as possible, agricultural literature to meet the needs of any reader. Particular books or bulletins are recommended because they are thought to be of special interest to the reader in his individual study, not because they are considered superior to others on the same subject. The following is a list of books in which the data presented in this lesson are much amplified and to which the student will naturally turn for more complete information:

Engineering for land drainage. By Charles G. Elliott. John Wiley and Sons. 1912. $1.25.

Physics of agriculture. (Chapters XII-XV.) By F. H. King. Published by the author, Madison, Wisconsin. 1907. $1.40.

Land draining; a handbook for farmers. By Manley Miles. Orange Judd Company. 1892. $1.

Proceedings of the New York State Drainage Association. For the years 1910–1911, p. 1–96, 25 cents; for the years 1912–1913, p. 1–140, 35 cents. Address E. O. Fippin, Secretary of the Association, Ithaca, New York. (These pamphlets contain much practical data on the methods and cost of and the returns from drainage.)

Tile drainage on the farm. By A. G. Smith. Farmers' Bulletin No. 524, United States Department of Agriculture, Washington, D. C.

ADVANCED READING-COURSE IN FRUIT GROWING

The Advanced Reading-Course in Fruit Growing aims to assist those who desire to make a careful and systematic study of fruit growing at home. It is especially provided for those who have completed a study of the available Reading-Course lessons in fruit growing. The particular advantage of this course consists in an opportunity of preparing statements on important questions of orchard management, which are graded by a specialist and returned with helpful comments and suggestions. Individual attention is thus given to each member of the course. A textbook and correspondence are used, so that the course is conducted in a manner somewhat similar to a correspondence course. The textbook may be obtained at a cost of $1.35, which is the only expense connected with the course except the necessary postage.

Any resident of New York State who desires to enroll for the Advanced Reading-Course in Fruit Growing should write for further directions to the Supervisor of the Reading-Course for the Farm, College of Agriculture, Ithaca, New York.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

Entered as second-class matter at the post office at Ithaca, New York

B. T. GALLOWAY, *Director* A. R. MANN, *General Editor*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

VOL. IV. No. 78 DECEMBER 15, 1914 THE SOIL SERIES No. 5

LAND DRAINAGE AND SOIL EFFICIENCY

DISCUSSION PAPER

A supplement called the discussion paper is sent with each Reading-Course lesson, for the purpose of bringing out the main points covered and of calling attention to related agricultural facts, practices, or methods. The College encourages an expression of opinion or a statement of experience by means of the questions asked. Each discussion paper filled out and returned will be read carefully and a personal reply will be made if agricultural information is desired regarding personal or community problems or the subjects studied.

New readers should enroll in one or more of the following series of Reading-Course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT-GROWING, FARM CROPS, STOCK-FEEDING, VEGETABLE GARDENING, PLANT-BREEDING, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, readers should sign and return this discussion paper, whether the questions are answered or not.* As an aid to students taking Reading-Courses, study clubs may be formed in various localities. References for advanced reading will be given on request. *The space below on this page is reserved for correspondence concerning Reading-Course work, and also for names and addresses of any persons likely to become interested on receipt of information.*

(In answering questions, attach additional paper if needed and number the answers.)

The following questions will call attention to the soil conditions in your home region. We should be glad to have you direct our attention to any soil conditions that you consider as needing special investigation, or to any practices that you consider especially successful or especially unwise as applied to your soils.

1. Explain the relation of underdrainage to the forms and amounts of moisture in the soil.

2. Enumerate and explain twelve beneficial effects of land drainage.

3. Explain why hill land may need drainage.

4. Describe four materials that may be used for drainage purposes, and point out the advantages and disadvantages of each.

5. Does your farm or your neighborhood need more underdrainage? What are the indications of such need?

6. Enumerate and explain briefly the indications of poor drainage of the soil.

7. State briefly any personal observation you may have made of the effects of underdrainage, enumerating benefits.

8. State how you would decide on the plan of arrangement of drains. What chief factors would you take into account?

9. Name the most important operations in constructing underdrains, and briefly state why you consider these the most important.

10. State the more important legal privileges and restrictions involved in land drainage in this State.

Name..

Address ....

Date..

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VOL. IV. No. 80 JANUARY 15, 1915 POULTRY SERIES Nos. 1 and 2 revised

INCUBATION

F. T. FINCH[1]

The essentials for successful incubation are: (1) eggs possessing strong hatching qualities, (2) a good hatching device, (3) correct methods of operation, (4) a favorable environment. The absence of one or more of these factors means that a lower percentage of the eggs will be hatched than should be, and that the chickens hatched will be weak.

In order to secure the quality of eggs desired for hatching purposes, there must be strong, active breeding-stock that is skillfully housed, yarded, and fed; and the eggs must be properly handled and selected before incubation. It is the purpose of this lesson to discuss how the other three essentials of successful incubation may be secured.

NATURAL INCUBATION

In most respects a hen is still superior to an artificial incubator as far as methods and results are concerned. However, there is as much opportunity for choice between the different breeds of hens for incubation purposes, and between different hens of the same breed, as between the different types of incubators.

If the natural method of hatching chickens is to be employed, it will be well to choose sitters from the general-purpose breeds, such as the plymouth rock, the wyandotte, the Rhode Island red, the orpington, and others of this type. Sitters from the breeds of the type most suitable for use as meat, such as the cochin, the brahma, and the like, are usually faithful but clumsy. Hens from the breeds of the type most valuable for egg production, or the so-called non-sitting breeds, such as the leghorn, the hamburg, and the like, are too small, usually light, and untrustworthy. In selecting hens for brooding purposes, it is well to choose those that are the least excitable when approached. A nervous hen is likely to break some of the eggs in the nest or to step on the little chicks.

[1] Revised by H. P. Buchan.

The success of natural incubation depends not only on the hen's ability to hatch fertile eggs, but also on the nesting place and the surrounding conditions. The hen that steals her nest and sits undisturbed usually hatches a good brood of chickens. The conditions existing in a henhouse or any building where hens are set should be made as nearly like the natural conditions as possible. Hens should be set where laying hens cannot be with them, and where they may have free access to a dust bath, to fresh water, and to a supply of grain. If necessary a small coop may be used, provided it is placed in a shady spot and the hen is allowed her freedom or the run of a small yard. If a broody hen is to be moved, this should be done at night in as gentle and careful manner as possible. The nesting box should be placed where the hen will have easy access to it, preferably on the floor or on the ground. If it is placed on the ground, the bottom of the box should be knocked out and the earth underneath should be covered with clean straw or leaves. If the box is elevated, or if it is on the floor, some damp soil may be placed in the bottom of the box. This soil should be arranged to conform to the hen's body, and should be covered with a layer of straw. (Fig. 51.) The box should not be too deep, lest the hen break the eggs when she jumps down into the nest. On the other hand, if the box is too shallow the chicks may get out of the nest at hatching time and may be unable to get back. The most satisfactory nesting box is about fourteen inches square and twelve inches deep.

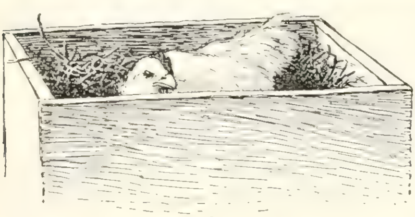

FIG. 51.—*Box nest*

When all is prepared for sitting, the hen and the nest should be thoroughly dusted with lice powder, and this dusting should be repeated three or four days before the eggs hatch.[2] The hen should be set on china eggs until she becomes accustomed to her new surroundings. If she settles down at once, the hens' eggs may be placed under her the following night. It is best to keep her shut in the nesting box at first, in order to make sure that she does not leave the eggs. In case any eggs are broken in the nest, they should be removed at once, and the straw should be replaced by a fresh supply. If any of the remaining eggs become smeared, they should be washed with warm water.

[2] Lawry lice powder may be used very successfully for dusting hens or young chicks. It consists of ¼ pint of crude carbolic acid, ¾ pint of gasoline, and 2½ pounds of plaster of paris. The liquids should be mixed thoroughly before adding the plaster of paris. The latter should be well mixed with the liquids and rubbed between the hands, then the mixture should be passed through a mosquito-wire screen and allowed to dry. Great care should be used in applying this powder; otherwise both hen and chicks may be injured. A small pinch of the powder is sufficient for each fowl. This should be worked in through the feathers, especially about the vent and under the wings. The powder may be kept indefinitely if it is placed in a tight package. It should not be applied until several days have elapsed after it is made. It should not be kept in a hot place.

After the eggs have been incubated for seven days they may be tested, and those that contain dead germs or those that are infertile may be removed. If several hens are set at the same time, the eggs from two hens may often be placed under one hen after the undesirable eggs have been removed. The other hens may then be set again, or may be placed in a special coop for broody hens.

Before the chicks are hatched, provision should be made for the hen and her brood. When the chicks are twenty-four to thirty-six hours old they may be removed from the nest and placed in coops provided for them.

After the hen and the chicks have been removed to a coop, the nest should be disinfected and the litter burned. A liquid disinfectant is best for this purpose, and it should be used with a spray pump.

ARTIFICIAL INCUBATION

The operation of the incubator is but one of the several factors determining the success of a hatch; yet it is possible, through carelessness or neglect in such operation or through ignorance of the principles of incubation, to destroy completely the hatching power of strong and fertile eggs. On the other hand, careful and intelligent operation may secure excellent results from strong eggs and really satisfactory results from weaker eggs. By slightly changing his methods the experienced operator is able to counteract, to some extent, the effect of certain mistakes in operation. Success in artificial incubation comes only through a thorough understanding of the factors discussed in this lesson.

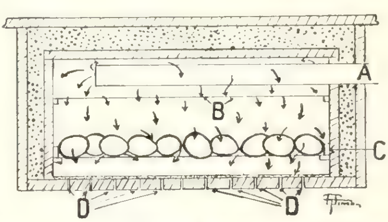

FIG. 52.—*Diffusion method. A, Hot-air pipe; B, porous diaphragm; C, egg tray; D, space between bottom boards for ventilation*

Incubators may be divided into two classes: those heated by hot air, and those heated by hot water. The former system is employed more extensively in heating incubators ranging in capacity from sixty to six hundred eggs. Incubators holding one thousand eggs or more are heated by a hot-water system. There is little reason why either one of the means of heating should have greater success in hatching eggs than the other, provided the same method of supplying heat to the eggs is used and other factors are equal.

The most successful methods of supplying heat to the egg chamber of an incubator are by diffusion and by radiation. There are incubators that combine these two methods successfully, and others that use one or the other method with good results.

Diffusion.—By the diffusion method the fresh air enters the heater, is warmed, passes into the upper part of the egg chamber, and is diffused through the pores of a diaphragm of burlap or other material. It then passes down over and around the eggs, and out of the incubator through the ventilators or the heater.[3] (Fig. 52.)

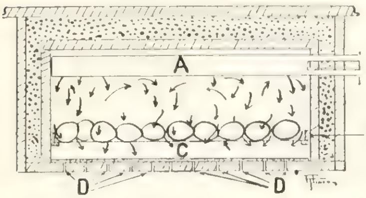

FIG. 53.—*Radiation method. A, Metal radiator; B, C, egg tray; D, ventilators*

Radiation.—By the radiation method heat is supplied to the egg chamber by direct radiation from a hot-air or a hot-water tank or pipes. (Fig. 53.)

The contact method of supplying heat to eggs that are being incubated is little used. Although this method approaches natural incubation most nearly, it is the least successful. (Fig. 54.)

QUALITY AND CAPACITY OF INCUBATORS

Quality should be the first consideration. The main qualification of a good incubator should be first-class material put together in such a way that the process of incubation may be carried on successfully, conveniently, and inexpensively. The value of an incubator should not be based on a record hatch that was obtained when the incubator was operated by an expert; neither should an incubator be condemned because an inexperienced operator fails at first to get good results. The best incubators for average operators are those by which the problems of supplying heat, moisture, and ventilation, are so simplified and controlled that good hatches may be obtained in various localities and under varying atmospheric conditions.

If enough chickens are to be hatched each season to make it advisable to incubate by artificial means, a considerable amount of time and extra expense may be saved by installing incubators of large capacity. Incubators holding two hundred and fifty to four hundred eggs are desirable. The expense for oil and labor required in operating large incubators is surprisingly small in comparison with the amount used in operating enough 60- or 100-egg incubators to hold the same number of eggs; and the results usually obtained with the former are enough better to warrant their use. The smaller the incubator, the more

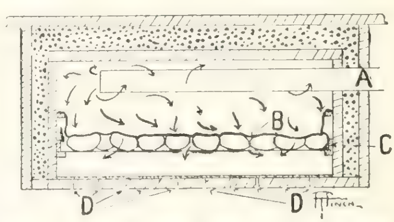

FIG. 54.—*Contact method. A heated surface is brought in contact with the eggs. A, Hot-air pipe; B, heated surface; C, egg tray; D, ventilators*

[3] Nearly every company manufacturing incubators has its own method of letting out of its incubator the air that has been used.

easily is the temperature of the egg chamber influenced by the outside temperature. The size of the incubator should be governed by the number of chickens to be hatched each season, due consideration being given to the possible desire to increase the number.

DIRECTIONS FOR SETTING UP INCUBATORS

When an incubator is received from the manufacturer, the first thing to be done is to remove the crating and to place the incubator in the room in which it is to be operated. A list of the different parts should be checked with the parts in order to make sure that no mistake has been made by the shipper. The detachable parts should be removed from the incubator, and the legs should be fastened in place. The front legs should be securely fastened first, and the machine should be raised to an upright position; then the rear legs should be screwed on in the same way, and the incubator should be placed where it is to be operated.

The machine should be perfectly level in order to afford an even distribution of heat. In order to insure this, a spirit level should be laid on the top, both crosswise and lengthwise. When the incubator is properly leveled, small blocks of wood or pieces of shingle may be placed under the legs, where necessary, in order to keep it in that position.

The regulating device

The regulating device for most incubators consists chiefly of (1) a wire connecting-rod, (2) a thumbscrew, (3) a counterpoise rod, (4) a counterpoise weight, (5) a regulator bar, (6) a thermostat, (7) a metal connecting-

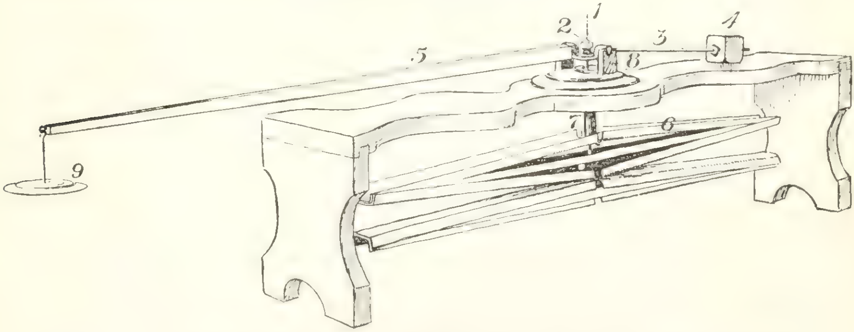

Fig. 55.—*A common type of regulating device with the parts properly connected*

tube, (8) a base and pivot casting, and (9) a disk. (Fig. 55.) These parts of the regulating device are named in the order in which they are numbered in the figure, but they are discussed in the following paragraphs in the order of their importance. The apparatus shown represents only one type of

regulator, and this is used because it happens to be the one at hand. However, the principles followed are very similar in all incubators.

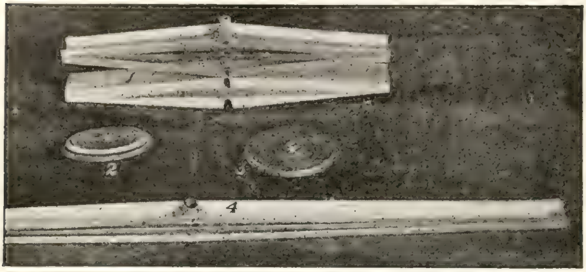

FIG. 56.—*Several styles of thermostats*

The thermostat.—The thermostat is a most important part of an incubator. The ability of an incubator to hatch eggs depends largely on the sensitiveness and the power of the thermostat. As the heat expands the thermostat, the latter, if it is properly connected, pulls down on the connecting rod that is fastened to the regulator bar by the thumbscrew, raising the disk that is hooked to the end of the regulator bar over the heater, and thus allowing the surplus heat to escape. As the amount of heat decreases, the thermostat contracts, allowing the disk to drop down on the heater. The thermostat is usually in place when the incubator comes from the factory, but if it is found loose or detached, little difficulty should be found in screwing it into place.

There are several styles of thermostats now on the market, as seen in Fig. 56. This illustration shows (1) the six-bar type, (2) the double-disk type, (3) the single-disk type, (4) the three-bar type. The style most commonly used is composed of three metal bars, usually a bar of steel between two bars of zinc. These bars are riveted together at both ends and expand in the center when heated; therefore the connecting rod is passed through the bars at this point and is fastened to the lowest bar (Fig. 56, 4). The six-bar thermostat is merely two three-bar thermostats riveted together (Fig. 56, 1). Both these types are very satisfactory. The disk, or wafer, thermostats (Fig. 56, 2 and 3) are usually made of copper and are filled with a very sensitive fluid. They are very susceptible to a slight change in temperature.

In addition to the types shown in Fig. 56, there is a four-bar thermostat that is both sensitive and powerful (Fig. 57). It is composed of two bars of steel and two bars of zinc, which are riveted together in such a way that the expansion is greatest at one end. To this end the connecting rod is fastened.

FIG. 57.—*Four-bar thermostat*

The regulator bar.—The regulator bar should be placed so that the pivot casting rests squarely on the base casting, as indicated in Fig. 55, with the disk, when it is attached, hanging directly over the exhaust in the top of the heater. The disk should cover the exhaust hole evenly, entirely closing it when it is down; otherwise some heat will be lost and the effectiveness of the action of the thermostat will be lessened.

The connecting rod.—The connecting rod should be passed down through the connecting tube and into the hole in the top of the thermostat. In some incubators the connecting rod passes through the thermostat and is fastened by screwing a nut to the bottom of the rod; in others, the rod merely screws into the thermostat; either way is satisfactory.

The counterpoise rod and weight.—The counterpoise weight is usually adjusted on the rod before the incubator leaves the factory, and should not be moved unless it has been pushed back so that it overbalances the bar, thus preventing an easy action of the bar when it is lightly pressed down from the wire connecting-rod. In the latter case, the weight may be moved until the bar works freely when the thumbscrew on the connecting rod is loose above the bar. The counterpoise weight should never be moved in order to regulate the heat.

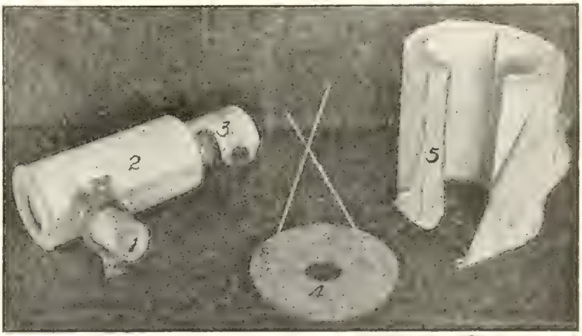

FIG. 58.—*Parts of heater. 1, Screen; 2, fume exit; 3 (below 2), fresh-air entrance; 4 (below 3), metal cap; 5, asbestos jacket*

The heater

The heater is attached to the incubator when it comes from the factory, and no changes should be made unless it has been damaged. The heater should be gas-tight, fireproof, and strong, and it should be constructed of a material that will hold all the heat given off by the lamp, thereby making it necessary to run only an ordinary flame with an economical use of oil. The heater should be cleaned very carefully and thoroughly, especially if the lamp has smoked. A wire with a cloth fastened to one end should be used, and the cleaning should be done by inserting the cloth into the opening and twisting it until all the soot is removed. The isinglass should be cleaned thoroughly after the soot has been removed; otherwise it will be difficult to see the flame. An oily cloth should never be used in cleaning incubator heaters. In case

the isinglass has been broken, it should be replaced in order to prevent fumes from getting into the egg chamber and in order to protect the flame from drafts. The different parts of the heater are shown in Fig. 58.

Felts and diaphragms

One type of incubator has felts or burlap diaphragms in the bottom. The operator should be sure that these are arranged properly before undertaking to heat the incubator. To remove these felts or diaphragms while eggs are being incubated, except as advised by the maker of the incubator, would greatly lessen its hatching power in most cases.

The thermometer

When an incubator is in operation, the thermometer should be kept in the place designated by the manufacturer. No other make of ther-

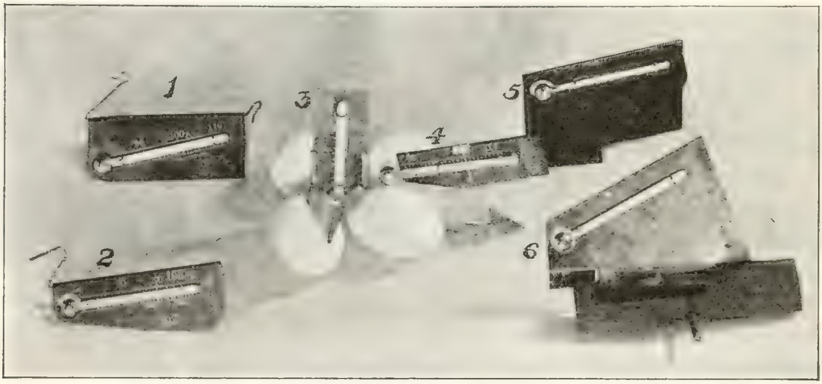

FIG. 59.—*Several styles of thermometers. 1 and 2, Hanging; 3 and 4, contact; 5 and 6, standing*

mometer than the one recommended by the manufacturer of the incubator should be used. The most common types of thermometers are the contact, the standing, and the hanging (Fig. 59).

A new thermometer should be tested before it is used; an old one should be tested each season. In order to test a thermometer successfully, a physician's clinical thermometer should be used as a standard, or any standard thermometer that registers correctly between 100° and 110° F. The two bulbs should be dipped at the same time into water registering about 100° F. If the temperature recorded by the thermometer being tested varies from the temperature recorded by the thermometer being used as a standard, the amount of variation should be marked on the back of the thermometer or on a tag tied to it, and allowance should be made

for this variation when the thermometer is used in the incubator. If the variation is great, the thermometer should be returned to the company that furnished it.

If the mercury in a thermometer should become separated, it may usually be brought together by swinging the bulb downward quickly, or by running the temperature up several degrees above the point indicated by the separated mercury.

INCUBATING CELLARS

An ideal incubating cellar is a very valuable factor on a large poultry farm, or in case enough eggs are to be incubated each year to make it necessary to operate several incubators. Otherwise, a clean, well-ventilated cellar in a dwelling house or any other suitable room may be used if proper precautions are taken. If a cellar originally designed for other purposes is available, it should be thoroughly cleaned before being used as an incubating cellar. Good ventilation should be provided, and this may be obtained by opening the windows and placing a thin muslin curtain over each opening. There should be at least two windows arranged in this manner, even if only one incubator is to be operated. In very cold weather the windows should be partly closed, especially on cold nights. When a cellar is not available, a room above ground may be used, but the best conditions for successful artificial incubation prevail in a room that is partly underground. There it is easier to keep an even temperature and to retain moisture.

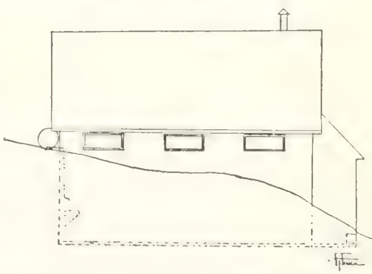

FIG. 60.—*A good location for an incubating cellar*

If possible, incubators should be operated in a building used for no other purpose.

The location.— If a cellar is to be built especially for incubators, a site should be chosen far enough from the other farm buildings to avoid great loss from fire in case of accident, but not so far away as to be inconvenient. Sloping ground is an ideal building site for an incubating cellar. The building may then be erected parallel with the slope, having one end of the incubating room almost entirely below ground and the other end coming out above ground, or nearly so, thereby making it possible to secure good air and drainage. This arrangement is shown in Fig. 60.

The building.— A room ten feet high, with a distance of seven feet from the floor to the bottom of the windows, is very satisfactory. A high ceiling is especially beneficial. If the windows are placed properly, they are not at all objectionable in an incubating cellar. If the windows

are hinged at the bottom, they may be allowed to drop part of the way open and they may be fastened securely in this position by a small chain or a strong cord. By this method of ventilation the air passes over the windows and into the room, an arrangement that does not permit direct drafts to reach the incubators. It is also advisable to place muslin curtains over the windows that are left open permanently, depending on the other windows for most of the light. The latter may be shaded in case the sun shines through them on the incubators or in case the sunlight affects the temperature of the room.

The writer's idea of a very good incubating cellar is represented in Fig. 61.[4]

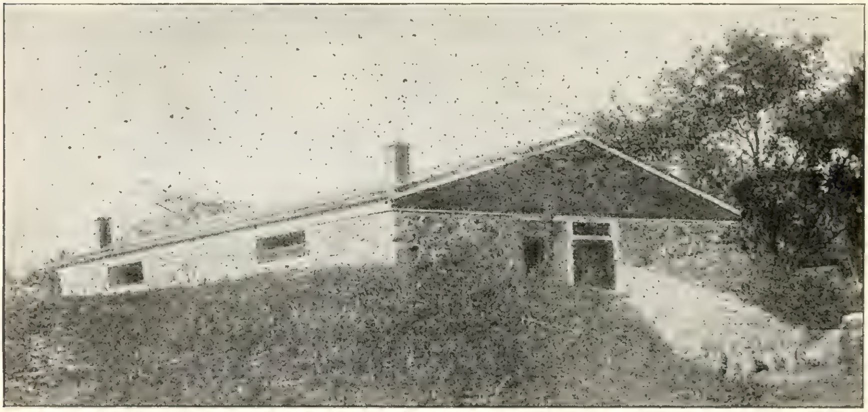

FIG. 61.—*A good incubating cellar*

THE OIL SUPPLY

A considerable amount of labor may be saved by piping the oil to the incubating room. This is often done by placing an oil tank underground a few feet from the cellar wall, the oil being conveyed from the tank to the cellar by means of a small pipe. This pipe is connected with one or more faucets. A very simple and inexpensive arrangement is shown in Figs. 62 and 63. The framework on which the barrel of oil rests is made of planks about twelve inches wide. The upper edges of these planks are cut so that they conform to the shape of the barrel. The barrel should be placed in the shade in order to prevent evaporation of the oil, and if possible it should be placed on the north side of the building. If this position is inconvenient, the barrel may be placed on the east or the west side of the building, under an open shed.

[4] The incubating cellar in the illustration belongs to Mr. Joseph Tolman of Rockland, Massachusetts.

A short pipe, with a faucet attached, should be screwed into the spigot opening of the barrel. The barrel may then be rolled into place, and the faucet connected with the pipe leading into the cellar by means of a short rubber hose.

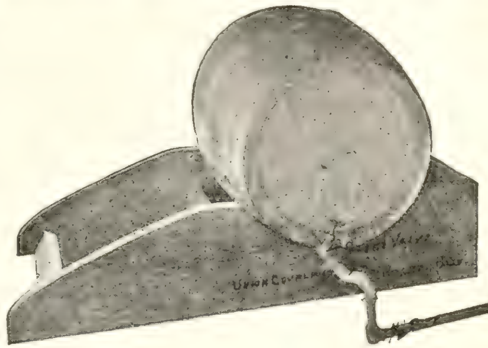

FIG. 62.—*The oil barrel in position*

The oil faucet in the cellar should be placed in a convenient location, preferably in a corner at some distance from the incubators. A pan should be placed underneath the faucet in order to catch the dripping and to prevent waste of the oil. A small table on which to place the lamps should be provided near the faucet.

THE LAMP

The results of incubation will depend largely on the care given to the lamp, for which one person should be responsible. No one else should raise or lower the flame, or interfere with the lamp in any way except in order to prevent an accident. The lamp should be filled, the wick trimmed, and the burner cleaned, once each day.

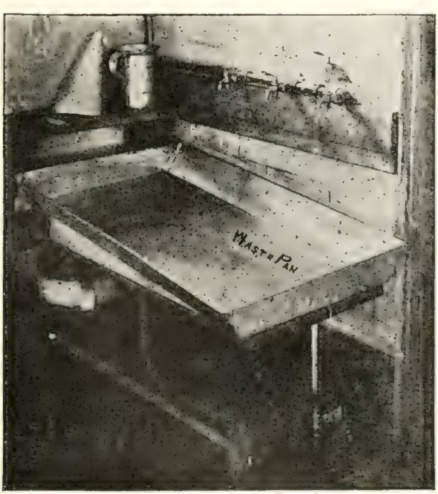

FIG. 63.—*The interior arrangement for drawing the oil*

Filling the lamp.—A regular hour should be assigned for filling the lamp, preferably in the morning and never at night, and all other work should be arranged to conform to this time; otherwise the lamp may be neglected and serious results may follow. The best time in the morning for this work is immediately after the eggs have been cared for. If the lamp is handled before the eggs are turned, the hands may become oily and thus the eggs may be soiled. Incubator lamps should be filled to within one half inch of the top, and never completely full. Only the best grade of oil should

be used. Before replacing the lamp, the oil should be carefully wiped off with a cloth kept for the purpose.

Trimming the wick.— The wick should be trimmed so that it will produce a square, clean-cut flame. The proper method of trimming the wick is to throw back the top of burner, turn the wick down slightly, and cut away the burned part. A putty knife is best for this purpose. The charred part should be simply shaved off, and no attempt should be made to cut into the wick. Scissors should not be used, for too much of the wick is likely to be cut away or the wick tube may be pinched.

Cleaning the burner.— Before cleaning the wick tube, the wick should be turned down in order that it may not be disturbed and the flame thus be made irregular. All the black material should be removed by sand-paper, a knife, or any sharp instrument, and the tube should be wiped with a cloth. Care should be taken not to bend the wick tube; such bending will prevent the wick from working freely. The other parts of the burner should be cleaned thoroughly. The screen around the wick tube should be cleaned once each week, and the burner should be boiled at least once each season in hot water containing washing powder.

Regulating the flame.—A new wick or one that is newly trimmed should be watched at first in order to prevent the flame from running up and smoking. The flame should be maintained sufficiently high to keep the temperature at the proper degree and to keep the disk raised slightly during the day. In case the room temperature drops at night, the surplus heat will be used to prevent a drop in temperature in the egg chamber. If the flame flickers, the operator should look for a broken isinglass in the heater and should see that the burner is in place and is working properly.

Regulating the heat.— The heat is regulated by turning the adjustment nut that is above the regulator bar on the connecting rod. By turning the adjustment nut to the left until the disk over the heater drops flat on the exhaust of the heater, all the heat will pass into the incubator and the temperature will be increased. By turning the adjustment nut to the right and thus raising the disk, the heat will be allowed to escape. When the proper degree of temperature has been reached, the thumb-screw should be turned until the disk is about one eighth of an inch above the heater. When the amount of heat is once correctly regulated, the temperature will vary only slightly if proper care is given to the lamp flame. Changes in the temperature of the air outside should be met by altering the lamp flame, not by changing the regulator; as the chicks develop, however, more heat will be given off from the eggs, and the resulting increase in temperature will necessitate changing the regulator. The eggs should never be placed in the incubator until the temperature is properly regulated.

TEMPERATURE, MOISTURE, AND VENTILATION

Temperature

After the eggs have been placed in the incubator, the temperature will drop and will remain low for several hours; it will then gradually rise, taking perhaps twelve to fourteen hours to reach the desired degree. The operator should not attempt to increase the heat too rapidly, but should allow it to increase gradually. When the correct degree of temperature is reached, there should be only slight variations of temperature during the period of incubation. Although it is best to maintain an even temperature, it is not always possible to do so, and an occasional variation of one half degree, or slightly more, will not result seriously if the average temperature is correct. A high temperature should be avoided, especially at the beginning of incubation. The temperature should be read through the glass door of the incubator, and this door should be opened as few times as possible.

Temperature during the first week of incubation.— The position of the thermometer should always be considered in determining the proper degree of temperature to be maintained. If the thermometer hangs above the trays of eggs, as it does in some incubators, thereby registering the temperature of the air and not that of the eggs, the actual temperature of the eggs is 1 to $1\frac{1}{2}$ degree lower during the first week than the registered temperature of the egg chamber. Therefore, in order to give the eggs the proper amount of heat during the first week, if hanging thermometers are used, it is necessary to keep the temperature at 102.5° or 103° F.; if contact thermometers are used, the temperature should be 102° F. Contact thermometers should always be placed between two fertile eggs.

Temperature during the second week of incubation.— The temperature within the incubator is less influenced by that outside after the first week, owing to the increasing amount of animal heat given off by the growing embryos. If hanging thermometers are used, the mercury should be held at 103° F.; if contact thermometers are used, the heat should be increased to 103° F.

Temperature during the third week of incubation.— The temperature should be maintained as near 103° F. as possible until about the eighteenth day, when it may be allowed to rise to 104° F.[5]

Moisture and ventilation

Oxygen is essential for the normal development of the embryo chick, the amount required increasing with the growth of the embryo. Eggs that are being incubated give off carbon dioxide, which is formed in the

[5] Directions for controlling the temperature after the eighteenth day are given under the heading "The hatching period."

developing chick by the combining of carbon and oxygen, and this increases in amount as the embryo grows. The eggs need, therefore, only a comparatively small amount of air during the first few days of incubation, as only a small amount of carbon dioxide is given off during this period. It is asserted by some authorities that the natural amount of carbon dioxide given off by the eggs is beneficial, on the ground that it aids in dissolving the carbonate of lime in the shells. Some experimenters go so far as to assert that it is really necessary for the successful development of the embryos. The writer is not yet ready to indorse this statement.

Excessive ventilation, permitting a rapid circulation of air in the egg chamber, would result in rapid evaporation of the moisture. Hence, for normal development of the embryos it is necessary to provide moderate, well-controlled ventilation throughout the period of incubation, or to check ventilation during the first part of the period and then to increase it as it becomes necessary. With either method it is essential that moisture shall be present in order to prevent undue evaporation. If the ventilation is checked, it is not considered so necessary to supply moisture as it is in cases where ventilation is continued through the entire period of incubation, because evaporation takes place much more slowly when the change of air in the egg chamber is lessened than when it is increased. The amount of evaporation of the egg contents may be controlled very successfully by maintaining a proper degree of humidity in air that is taken into the incubator. The humidity under a sitting hen usually registers about 60 per cent. If a non-moisture incubator is operated in a room in which the air is dry, owing to climatic conditions, or a room in which several incubators are being operated, it may be necessary to supply moisture.

Supplying moisture.— Unless the manufacturers so direct, moisture should never be supplied in an incubator.[6] If non-moisture incubators are operated in a dry place, the floor of the room may be kept wet unless it is of wood, in which event pans containing water may be placed under the incubators. The amount of moisture exhaled from a surface in a given space of time is governed by the extent of the surface and not by the depth of the receptacle. This principle should be remembered when supplying moisture in a room or in an incubator. In using incubators in which arrangements have been made for supplying moisture, certain days should be set for looking after the supply in order to avoid a possible chance of the moisture receptacle's becoming dry. The correct amount of moisture to be supplied to a given number of eggs can be determined only by watching and studying the size of the air cells.

[6] The same amount of moisture placed above the eggs that is often placed underneath them would cause complete saturation and would damage the hatch in most incubators; hence the manufacturers' directions should always be followed.

Moisture on the glass door of the incubator at pipping time usually indicates a good hatch. This moisture is due to the large amount evaporated from the chicks.

Controlling ventilation.— In some cases ventilation is controlled by slides over the ventilator openings, which are usually in the bottom of the incubator. In using incubators of this type, it is a good practice to restrict ventilation during the first five days of incubation by keeping the slides closed, opening them gradually after the fifth day until they are wide open. The temperature of the room must be considered in regulating the ventilators; and the warmer the weather is, the wider the ventilators may be opened. Some incubators have additional ventilators to be opened only after the chicks are through hatching; these must not be mistaken for the ventilators that are to be used during incubation. Constant ventilation is provided in some types of incubators that are not fitted with slides. Such machines should never be tampered with. The necessity of following the manufacturers' directions in regard to ventilation cannot be too strongly impressed on the mind of the novice.

HANDLING THE EGGS

The eggs should not be placed in the incubator until it has been heated for several days and properly regulated, and all directions have been followed in regard to adjustment of parts, special attention having been given to the manufacturers' directions concerning ventilators, felts, trays, and the like. Eggs of a uniform size, shape, and color should be chosen so far as possible, and those with very porous or otherwise defective shells should be eliminated (Fig. 64). A few more hours are usually required in hatching eggs from the heavy type of fowls than are needed for leghorn eggs; therefore it is not advisable to set the two kinds of eggs together in an incubator.

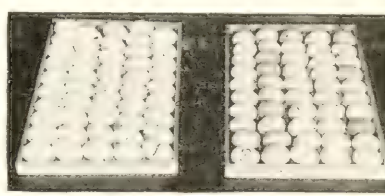

FIG. 64.—*Eggs for incubation; 1, Selected; 2, non-selected*

Turning the eggs.— From the time when the eggs become thoroughly heated until the chicks issue from the shells, more or less evaporation of the egg contents takes place. The yolk being lighter than the albumen, unless the position of the egg is changed at frequent intervals, there is a tendency for the yolk to gradually rise; and, as the developing germ retains its position on the upper side of the yolk, it will in time be forced against the inner shell membrane and become dried fast to it, this condition resulting in death to the germ. It is said that the sitting hen turns her eggs several times during the day and night; but conditions existing

in artificial incubation do not admit of so many turnings. However, it has been found essential to turn the eggs twice daily, beginning twenty-four to thirty-six hours after they are put in the incubator and continuing until the nineteenth day of incubation, on and after which the incubator should be kept closed. The additional fact that, as a rule, incubators do not supply an even distribution of heat to all parts of the egg tray, makes it doubly necessary not only that the eggs shall be turned twice each day, but that their positions on the trays shall be changed as regularly as the eggs are turned. Regularity in turning the eggs has much to do with the success of the hatch. The best time to turn the eggs in the morning is before any other work has been done in connection with the care of the incubator. The eggs must be turned again in the evening. These times for turning the eggs should be twelve hours apart, as nearly as possible. Not only does this arrangement enable the operator to have a specified time for doing the work, but it keeps the times for turning the eggs as far apart as is conveniently possible, and it equalizes the space of time between turnings — two important factors.

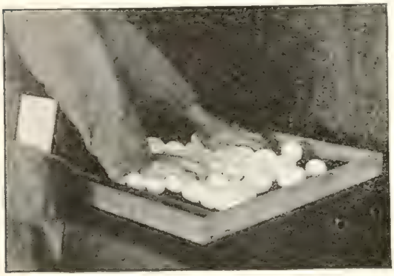

FIG. 65.—*Turning eggs*

Since the principal reasons for turning eggs are (1) to prevent the germ from drying to the shell and (2) to equalize the heat, it is necessary that the eggs be given a thorough shuffling (Fig. 65). This may be done satisfactorily by removing a few eggs from the center of the tray and by rolling the remaining eggs with the palms of the hands. The eggs should be rolled in such a way that those around the outer edges of the tray and in the corners will be worked toward the center, and those from the center toward the outer edges. The eggs taken from the center of the tray at the beginning of the operation should be placed in the corners of the tray. The eggs must not be shoved roughly against one another, nor rolled too vigorously. The tray may be turned end for end at each turning of the eggs; and if two trays are used they may be interchanged at one turning and turned end for end the next time.

Cooling the eggs.— The successful cooling of eggs during incubation counterbalances, to some extent, the still imperfect methods of ventilation. In order to cool eggs properly, the operator must consider the length of time they have been incubated, the weather conditions, and the room temperature. It is not known just how much cooling is necessary for the best results, nor can a time-table be made that will work successfully

with all types of incubators and under varying atmospheric conditions. But the fact that eggs incubated by hens undergo more or less cooling and yet hatch well, makes it appear essential that those artificially incubated shall be treated correspondingly. Results prove this theory to be true.

It has been proved that excessive ventilation causes a too rapid evaporation of the egg contents. Eggs cooled too much are affected similarly. Therefore, for the first seven days of incubation it is best not to leave them out of the incubator longer than is necessary for proper turning. The length of time to cool eggs may be determined by touching several of the eggs to the eyelid or to the lips. If the eggs are cooled sufficiently, they will feel cool at the first touch. They should never be left out of the incubator long enough to become cold. The expert operator can tell when the eggs are cooled to the proper point by placing the palms of the hands on the eggs. In this way he gets the average temperature of several eggs. The loss of heat from all eggs is not the same in amount during a given time. Eggs containing embryos of low vitality give up their heat much more rapidly than do eggs containing embryos of high vitality. Eggs should be cooled to the point at which they cease to give off heat and are about to become cold.

When cooling is begun, it will take only a very few minutes, perhaps four or five, to cool the eggs sufficiently; the length of time depends on the temperature of the room. The cooling should be gradually extended over a longer period as the embryos grow. In warm weather thirty to sixty minutes may be needed in order to air the eggs properly during the latter stages of incubation. On very sultry days extra cooling is beneficial; less is desirable on cool days. In cold weather only a comparatively short time will be required in order to cool the eggs sufficiently. Cooling may be done after either the morning or the evening turning of the eggs, or at both times. If the eggs are cooled twice each day, a period of only half the length of time mentioned above should be required each time.

Eggs may be cooled on a table, or perhaps on the top of the incubator. Care should be taken that no part of the tray containing the eggs shall project over the edge of the table or the incubator, for the eggs on the projecting part of the tray would be likely to become overcooled. Some authorities advise cooling the eggs in the incubator by opening the doors. This is not good practice. While the doors remain open the heat is constantly escaping, and the incubator becomes cooled as well as the eggs. A longer time is then required in order to bring the temperature of the egg chamber back to the proper degree than when the eggs are cooled outside and the incubator kept closed. Cooling should be discontinued on the nineteenth day of incubation.

Many accidents may be avoided if the operator forms the habit of looking at the incubators before leaving the room, making sure that the doors are closed and that everything is in place.

TESTING THE EGGS

Probably the most important of the several reasons for testing eggs during the period of incubation is that the person operating the incubator may learn the percentage of fertile eggs and the strength of the germs. If those are known to be unsatisfactory, it may be possible to make such changes in the mating of the breeding stock or in the environment surrounding the breeding stock as will add to the fertility of the eggs and will strengthen the germs in them, thereby increasing the percentage of eggs that will hatch and also improving the quality of the chickens hatched from them. If infertile eggs are left in the incubator, they are likely to make the temperature registered by the thermometer nonrepresentative of the eggs as a whole if a contact thermometer is used, for the temperature of an infertile egg or of one containing a dead germ is considerably lower than that of an egg containing a strong, living germ. The value of testing eggs during the period of incubation is shown particularly when three or four incubators are set at the same time, for the fertile eggs left in one incubator may be divided among the other incubators, thus saving oil and lessening the amount of labor. Removing the eggs containing dead germs helps to prevent the bad odors that are sure to accumulate during the time when eggs are being incubated. Odors from ducks' eggs are more noticeable than those from hens' eggs, and if they are incubated artificially, it is the more necessary that the bad eggs be removed from the incubator.

FIG. 66.—*Testing eggs: 1, Common testing device; 2, egg properly held; 3, incubator lamp; 4, untested eggs; 5, infertile eggs; 6, good eggs*

Infertile incubated eggs that have been carefully tested may be sold for a certain percentage of their original value if they are put on the market promptly. Incubated eggs offered for sale should always be labeled as such. In large cities they are used in bakeries and in households for cooking purposes. There is no reason why eggs of this kind should not be used in this way. They are, without doubt, as good as or better than many of the so-called fresh eggs on the market. If white eggs are being incubated and those that are infertile are to be sold for

cooking purposes, they may be tested on the fourth or the fifth day. Brown eggs are less easily tested, and it is usually advisable not to test them before the sixth or the seventh day.

In order to obtain the best results, the eggs should be tested first on the seventh day of incubation and again on the fourteenth day. A common method of testing is illustrated in Fig. 66. If the germs are strong and the eggs have been properly incubated, only a few dead germs should be found on testing the eggs a second time. It is better to do the testing at night unless the room can be darkened during the day. A convenient movable room for testing eggs either during the day or at night is easily constructed at a low cost in the following way: The framework should be made of 2 x 2-inch lumber. The side and back walls should be made of thin lumber down to about one and one half inch from the floor, and these walls should be painted black on the inside. Heavy black cloth or paper may be used in place of the lumber. Black cloth is preferable to lumber for use in covering the top, as the former will allow the heat to escape. The size of the room is governed by the space it is to occupy and by the size of the egg trays. A dark-colored window shade or a black cloth curtain should be hung over the entrance. A hole a little smaller than an ordinary egg should be cut in the rear wall of the room sufficiently high and at the proper distance from the side walls to be convenient in testing eggs held in the right hand. The work is less tiresome if this opening is directly opposite the right arm, and as low as possible without causing the operator to stoop. Brackets for the egg trays should be placed inside of the room along the sides, and boards the width of the tray should be placed on the brackets before the tray of eggs is placed on them in order to prevent the eggs from cooling too rapidly. A shelf is placed lower down in order to hold the trays for the infertile eggs and those containing dead germs. On the outside of the rear wall a third shelf should be provided for holding the lamp that is used in testing. Any ordinary lamp that can be fitted

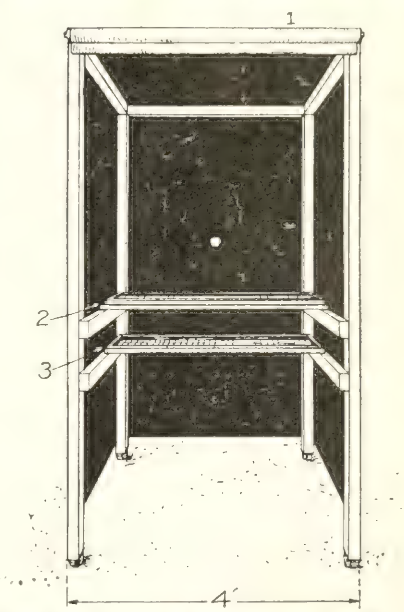

FIG. 67.—*Interior view of testing room: 1, Curtain rolled; 2, shelf and tray for untested eggs; 3, tray for infertile and dead germ eggs*

with an egg-testing device will answer the purpose, provided it gives a good flame; or a Rochester burner may be used without the testing device by placing a sheet of asbestos between the testing room and the lamp chimney. In case a testing device is used, the opening in it should be placed against the small hole in the rear wall of the testing room. By placing casters on the four legs of the testing room it may be moved from one incubator to another, thus avoiding the extra labor of carrying the eggs to and from the place where they are tested. This arrangement will prove a decided advantage in connection with incubators of large capacity; also, testing may be done very accurately during the daytime. The construction of this testing room is shown in Figs. 67 and 68.[7]

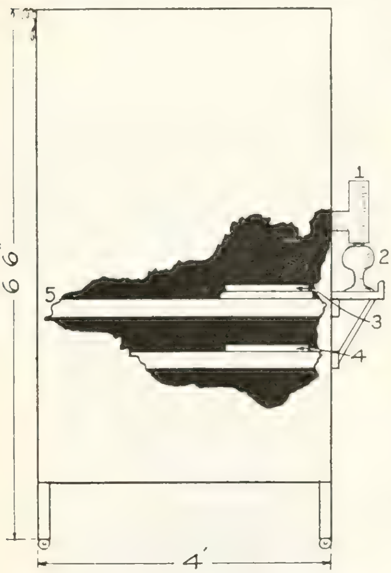

FIG. 68.—*Side view of testing room, wall cut away, showing: 1, Testing device; 2, lamp; 3, egg tray; 4, tray for infertile and dead germ egg*

If the operator prefers to do the testing at night, a common testing device and a house lamp are sufficient for the purpose. On bright, sunshiny days testing may be done accurately without a testing room by using a frame that fits tightly against a window facing toward the sun. This frame should be covered with heavy black cloth or paper, in which is cut a round or oval opening about the size of an egg. This arrangement is illustrated in Fig. 69.

During the winter it is advisable to cover the trays of eggs while they are being tested. This is not necessary in a warm room unless the eggs are out of the incubator for some time. In case the first test is made on the seventh day of incubation, the live germ, if it is strong, will show distinctly the blood vessels branching in various directions. The germ should be centrally located in this network of blood vessels, and it is usually found near the air cell, provided the egg is held with the large end up. A live embryo is easily moved by turning the egg about. Occasionally the germ will be hardly visible, but its presence is readily detected by a darker appearance of the egg contents than is shown by an infertile egg. If for any reason the person doing the testing is in doubt as to whether a germ is alive or dead, it is well to mark the egg and test it later; this practice will

[7] Mr. Robert Herman of Lakewood, New Jersey, designed a room very similar to the one shown here.

help to make the person testing the eggs more expert, and will add interest to the work.

An infertile egg that is being tested has the same appearance as a fresh egg, the only apparent difference being in the size of the air cell. In Fig. 70 may be seen several types of eggs and conditions of development as they appear after seven days of incubation. Dead germs are found on the seventh day in various forms and sizes, the most common of which are shown in Fig. 71 (2, 3, 4, 5, and 6). All these types should be discarded. Blood rings, also shown in Fig. 71, are caused by the bursting of the blood vessels, due to overheating or to other reasons causing a weakened condition of the embryos.

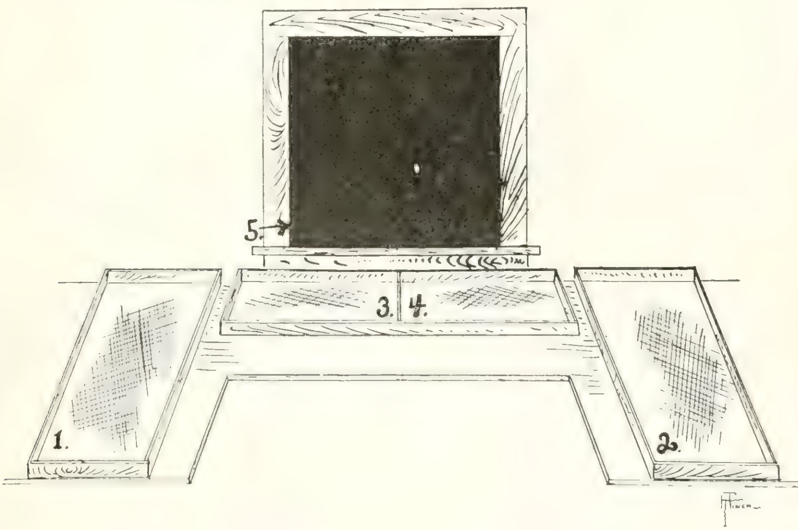

FIG. 69.—*A convenient arrangement for sunlight testing: 1, Tray for untested eggs; 2, tray for good eggs; 3 and 4, trays for infertile and dead germ eggs; 5, curtain in place*

The second test is more difficult to make than is the first. Many of the weaker germs will not differ materially in appearance from those that are dead, and some that have died within a few days of the time of the test cannot be distinguished from the living embryos. However, if an egg contains a strong living germ, the germ will be dark in color and apparently fairly well developed; the space below the membrane forming the air cell will be filled, making the division dark and firm; and occasionally life will be denoted by motion within the egg. The less developed the embryo appears to be, the fewer are the chances of its hatching. If the egg contents immediately below the air cell appear uneven and indistinct, and if the remainder of this division shows no development of the embryo as in the other eggs, it may be concluded that the germ is dead.

In Fig. 72 are shown drawings of some eggs containing living germs on the fourteenth day of incubation, and of other eggs in which the embryo is dead. By comparing the air cells as shown in Figs. 70 and 71 with those shown in Fig. 72, it will be seen that the air cell increases in size during the first two weeks of incubation. This increase continues until about the

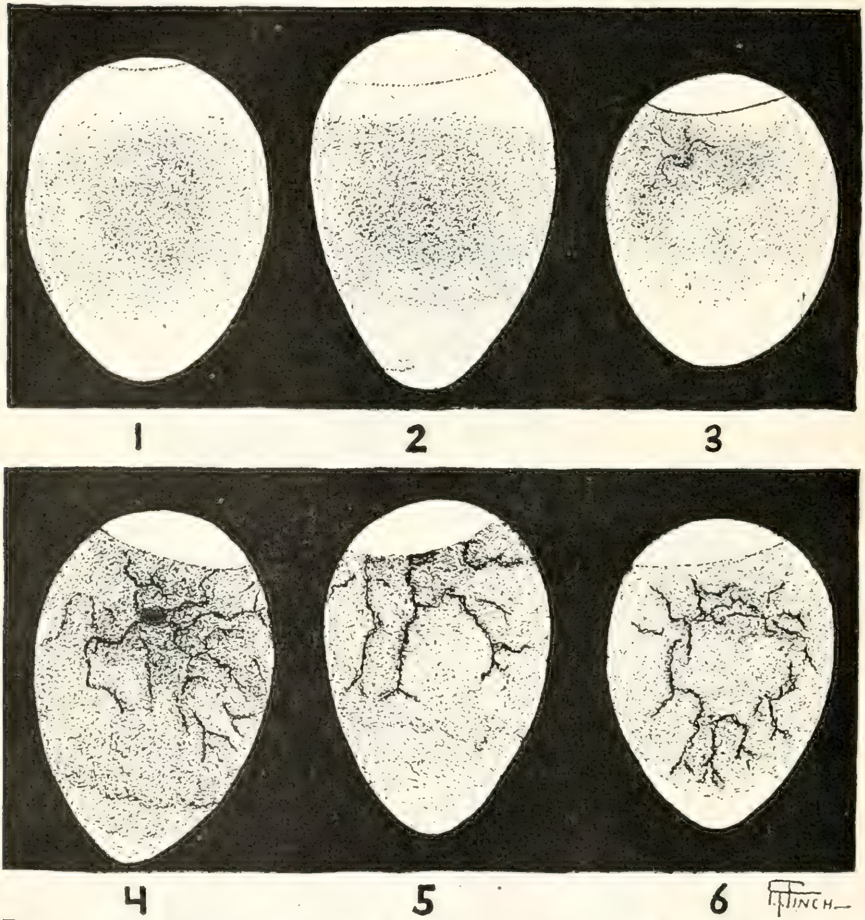

FIG. 70.—*Eggs as they appear when held before tester after seven days of incubation, compared with fresh egg: 1, Fresh egg; 2, infertile egg; 3, weak germ; 4, strong germ as most commonly found; 5, strong germ very near air cell; 6, germ not visible*

nineteenth day, the size of the cell varying somewhat with the individual eggs in the same incubator or under the same hen. The air cells in eggs under the hen are usually smaller than those in eggs artificially incubated. Eggs incubated in moisture incubators generally have smaller air cells than those incubated in non-moisture incubators. The air cell is found or-

dinarily at the large end of the egg, but occasionally one is found a little at one side or near the small end. Various positions of the air cell, and also the comparative sizes of the air cell at different periods of incubation, are shown in Figs. 73 and 74.

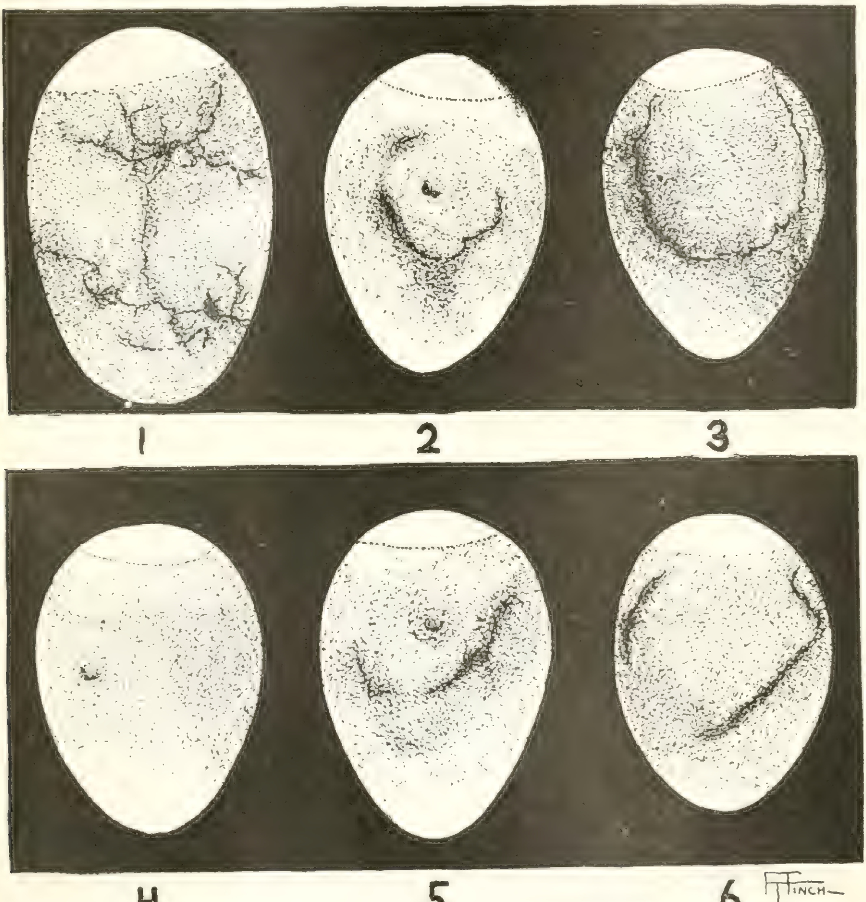

FIG. 71.—*Dead germs after seven days of incubation (2, 3, 4, 5, and 6), to be compared with a live germ as seen in 1 and in Fig. 70 (4 and 5): 1, Live germs in a double-yolked egg; 2, blood ring and germ stuck to shell; 3, blood ring; 4, floating germ; 5, floating germ and blood ring; 6, blood ring*

THE HATCHING PERIOD

Hatching time is a critical period in incubation, and special attention is necessary to the successful operation of the incubator. In most cases the incubator door should not be opened after the nineteenth day, and all work requiring handling of the eggs or opening of the door should be completed

on the eighteenth day. The trays should be so arranged that the chicks will drop into the nursery as they come toward the light. If the thermometer in use stands on the tray it should be securely fastened; otherwise the chicks will upset it, and this will necessitate opening the door

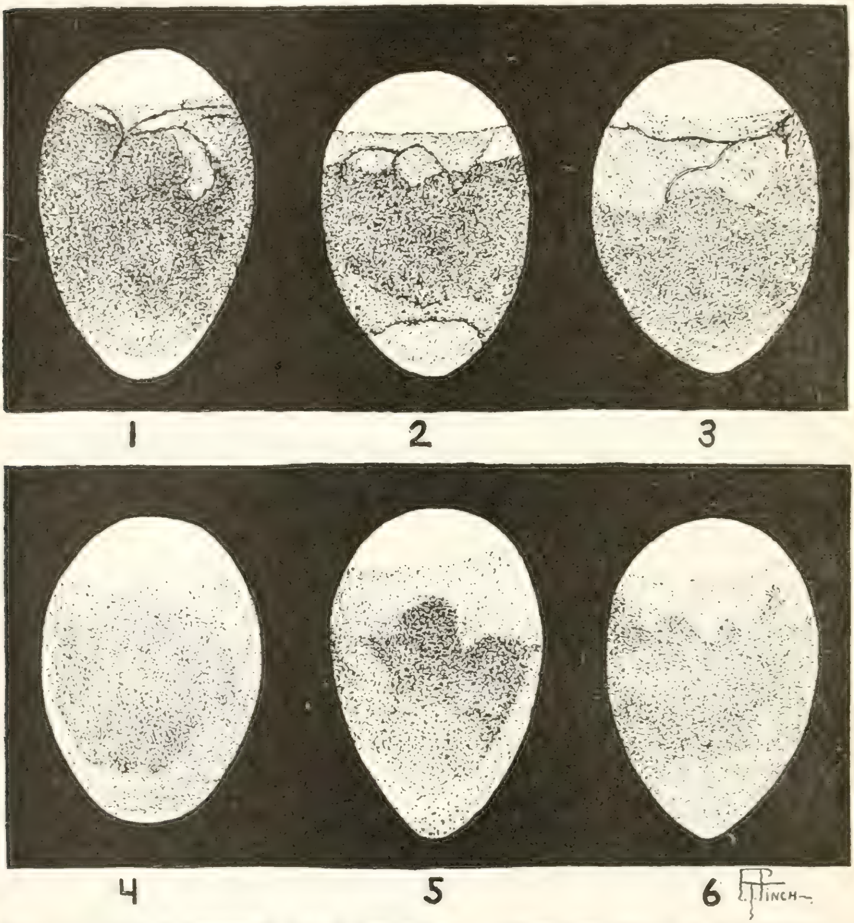

FIG. 72.—*Eggs at fourteenth day of incubation: 1, Strong live embryo; 2, live embryo; 3, weak live embryo; 4, 5, 6, dead embryos*

of the incubator in order to right the thermometer, or running the risk of a wide variation in temperature.

A temperature higher than 105° F. and one lower than 103° F. should be avoided at this time. Both these undesired extremes will occur at some time during the hatching period unless careful provision is made against them. It would be much better to remove the lamp for a time

than to permit the great increase in temperature that usually occurs when the chicks are coming out of the shell in greatest numbers. Generally, this increase may be overcome by turning down the lamp flame. Very often, toward the end of the hatching period it is necessary to raise the flame in order to keep the required temperature. These two changes in temperature in so short a time will be readily understood when it is remembered that the eggs supply a great amount of animal heat during the last week of incubation, and that this animal heat naturally increases as the chicks commence to work their way out of the shells. After the chicks are all hatched, and after they have dropped into the nursery, the heat decreases. There is also more or less condensation of moisture from the newly hatched chicks at this time, and this has a tendency to lower the temperature.

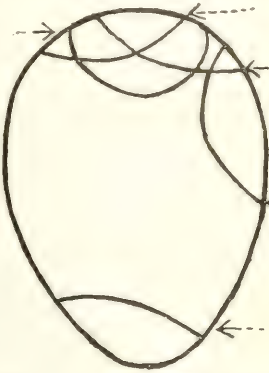

FIG. 73.—*Various positions of air cells*

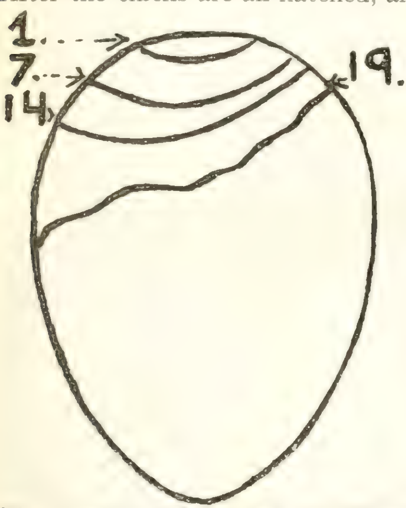

FIG. 74.—*Size of the air cell at different periods of incubation: 1 day, 7 days, 14 days, and 19 days of incubation*

The position of the ventilators at hatching time depends on the make of the incubator. It is not considered advisable to permit a very great change of air until the chicks are all out of the shell. After the hatch is completed, the egg trays should be removed, together with any eggshells that may have dropped into the nursery, and the ventilators should be opened to their full width. If the room is warm, the incubator door may be fastened open one half inch at the top.

The chicks should be left in the nursery until the day after the hatch. They should be thirty-six to forty-eight hours old when they are removed to the brooder. A box for transferring chicks to the brooder is shown in Fig. 75. If a market basket is used it should be lined with burlap, and a burlap blanket should be placed over the chicks.

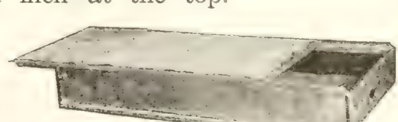

FIG. 75.—*A serviceable box for moving chicks from the incubator to the brooder*

DISINFECTING

Absolute cleanliness is essential to the successful operation of incubators. The germs of the various communicable diseases most common among young chicks are sometimes carried on the eggshells. In order to guard against future infection, the incubator should be thoroughly cleaned and disinfected after each hatch. If eggs are used from flocks that are not absolutely free from disease, they should first be dipped in grain alcohol that is 95 per cent pure. The eggs should be dipped quickly and dried immediately. However, dipping the eggs kills only those disease germs that are on the outside of the shells. Dipping is of very little use if the breeding

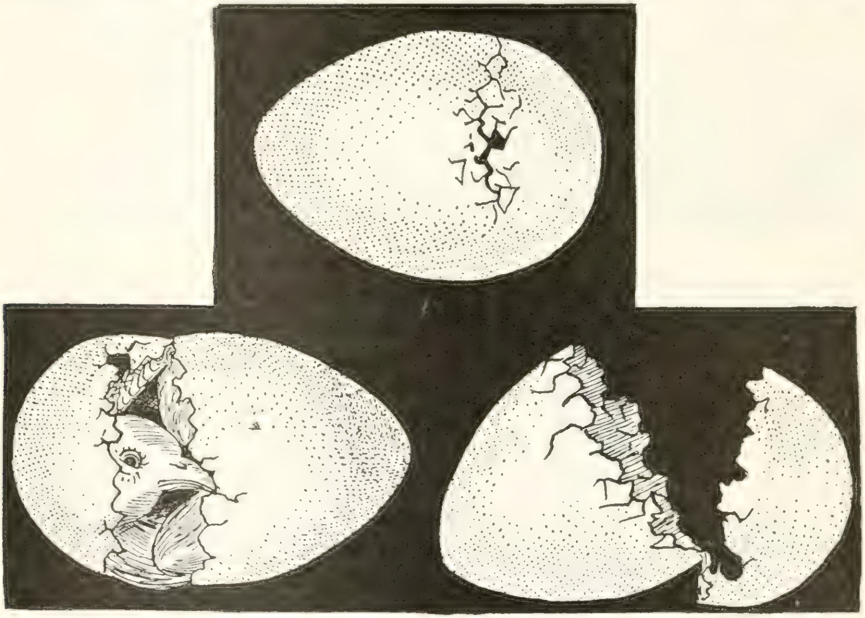

FIG. 76.—*Stages in the escape of the chick from the shell*

stock is affected with white diarrhea, for the germ of it is carried from parent to offspring by a disease germ within the egg.

In order to prepare an incubator for disinfection, all the portable parts should be removed, as shown in Fig. 77, and these parts should be washed with warm water containing a little soap powder. A putty knife or a stiff brush is excellent to use in removing the pieces of shell and the down that stick to the egg trays and the nursery trays. As soon as the burlap in the bottom of the nursery becomes soiled, it should be replaced with clean burlap sacking.

After the removable parts of the incubator have been thoroughly cleaned,

they should be disinfected and placed in the sun to dry. A disinfectant should also be applied to the inside of the incubator. A spray pump or a hard brush is a convenient instrument for distributing the disinfectant. The disinfectants used in the incubating cellar at the New York State College of Agriculture are creolin and zenoleum.[8] Either creolin or zenoleum may be recommended to do the work without having an injurious

FIG. 77.—*The parts of an incubator and the spraying outfit, ready for disinfecting*

effect on the hatch, provided the directions are followed. The odor from these disinfectants is mild and inoffensive. Of these two disinfectants creolin is the more expensive. In using any one of the two disinfecting agents, the proper proportion is one part of the disinfectant to nineteen parts of water, and the mixture should be stirred thoroughly.

The incubator should be carefully dried and aired before it is used again. It is well to close the door of the incubator for a day, keeping the lamp lighted, after which the door may be left open over night or until the incubator is well aired.

[8] Creolin and zenoleum may be bought at most drug stores.

CORNELL STUDY CLUBS

Cornell study clubs are local organizations of farmers and their families, and their aim is to promote the study of Cornell Reading-Course lessons for the farm and for the farm home. One of the chief benefits of these clubs is that they furnish an opportunity and an incentive for study. Often a helpful lesson will reach a farm home at a time when the members are too busy to give it attention, and it is soon forgotten. If, however, a special time is set aside for the study of reading-course lessons at a club, it is likely that much more reading will be accomplished. The secondary purpose of Cornell study clubs is to increase a neighborly feeling in the community and to offer an opportunity for an exchange of thought on subjects of common interest. In the meetings of a club the member should find enjoyment in an interchange of ideas and a training for free and orderly self-expression.

The organization of a Cornell study club can be easily effected even if at first only half a dozen persons desire to form a group. The president and the secretary of the club should be chosen, and the dates and places for meetings decided on. The meetings should be held frequently enough to maintain an active interest in them; regularly every two weeks during the fall and winter is usually considered sufficiently often. If it is not advisable to meet every fortnight in spring and summer, monthly meetings are suggested. Study clubs hold their meetings in churches, grange halls, and at the homes of the members. The meetings should proceed under a definite order of business.

Cornell study clubs may bring about cooperation in matters of public concern, and may grow to be influential factors in promoting community welfare. They may also prove of financial benefit by becoming agencies for cooperative buying and selling. The success of the Cornell study club must depend principally upon local leadership. It is hoped that public-spirited persons will find in the Cornell study clubs a means of improving the agricultural and social conditions in their communities. Visits from representatives of the college will be arranged when possible. Cordial cooperation in establishing study clubs may be obtained by writing to the Supervisor, Reading-Course for the Farm, or the Supervisor, Reading-Course for the Farm Home, College of Agriculture, Ithaca, New York.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

Entered as second-class matter at the post office at Ithaca, New York

B. T. GALLOWAY, *Director* A. R. MANN, *General Editor*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

VOL. IV. No. 80 JANUARY 15, 1915 POULTRY SERIES Nos. 1 and 2 revised

INCUBATION

DISCUSSION PAPER

A discussion paper is sent with each reading-course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self expression. Each discussion paper filled out and returned will be read carefully and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading-course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, readers should sign and return this discussion paper, whether the questions are answered or not.* By means of reading-course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading-course work, and also for names and addresses of any persons likely to become interested on receipt of information.*

(In answering questions, attach additional paper if needed and number the answers.)

1. Name the four factors essential for successful incubation.

2. What are the characteristics of the diffusion type and the radiation type of incubator?

3. Why is a cellar preferable to a room above ground, for incubation purposes?

4. At what temperature would you incubate eggs during the first week of incubation? the second week? the third week?

5. What are the conditions of temperature and of moisture in the room in which your incubator is operated? What results have you obtained?

6. Would you place eggs from different breeds of fowls in the same incubator? Have you noticed any difference in the time required to hatch brown eggs and white eggs when both these kinds were placed in the same incubator?

7. How would you determine the necessary amount of cooling of eggs during incubation? How should this vary during the incubating period?

8. Describe how the following types of eggs should appear when they are tested: (a) fertile eggs; (b) infertile eggs; (c) eggs containing dead germs; (d) eggs containing blood rings. What conditions are likely to be found on the seventh day, and what on the fourteenth?

9. How would you determine whether or not the eggs are becoming too dry? If moisture is needed, how would you supply it?

10. Describe fully the manner of disinfecting an incubator.

Name..

Address..

Date..

The Cornell Reading-Courses

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NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

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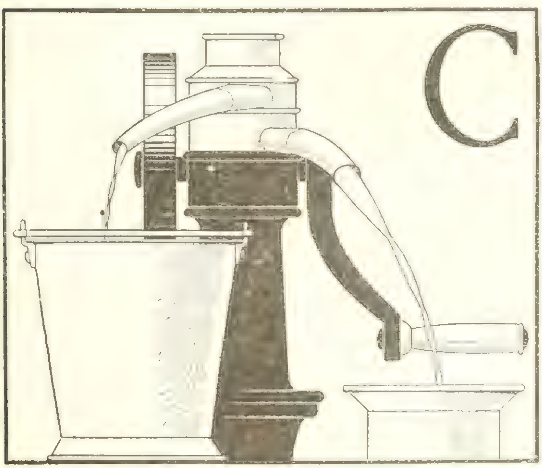
VOL. IV. No. 82 FEBRUARY 15, 1915 DAIRYING SERIES No. 5

CREAM SEPARATION

E. S. GUTHRIE



CREAM SEPARATION is one of the important processes in the handling of dairy products. The dairyman who uses a cream separator is interested not only in the proper operation of his machine in order to prevent undue loss of milk-fat, but also in the proper location of the separator from the standpoint of sanitation and convenience. The purpose of this lesson is to give the persons operating cream separators an understanding of the principles of separation as well as a few suggestions concerning the operation, the location, and the care of separators.

SEPARATION BY THE FORCE OF GRAVITY

The separation of cream and skimmed milk is possible because of the difference in the specific gravity of these two substances. The specific gravity of cream is difficult to obtain because cream is exceedingly variable in fat content and because it has a tendency to incorporate air. The specific gravity of milk-fat is .90 or .91. In view of the fact that about one-fourth to one-half of cream is milk-fat, it is readily seen that cream is much lighter than skimmed milk. The force of gravity acts in direct proportion to the

weight of matter. Skimmed milk is attracted to the earth with greater force than milk-fat because it is heavier. The lighter substance, cream, is crowded away from the earth, or to the surface of the vessel that contains whole milk. In ordinary phraseology, therefore, cream "rises."

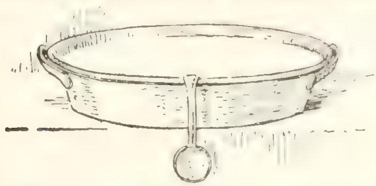


FIG. 78.— *The shallow-pan method*

There are three methods of cream separation depending on the force of gravity. They are the shallow-pan method, the deep-setting method, and the water-dilution method. In the first method, the cream is skimmed off with a shallow dipper, and in the other two methods the skimmed milk is drawn off leaving the cream. These gravity methods, however, have distinct disadvantages, one of the most important of these disadvantages being the loss of a small amount of milk-fat each time they are used. Tests of the relative merits of the gravity methods of separation have been made in order to determine how great this loss is.

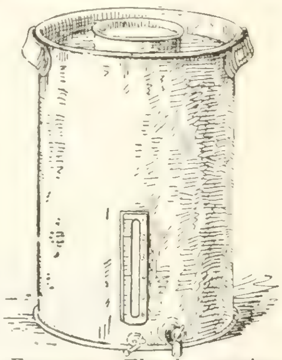


FIG. 79.— *The deep-setting method*

According to experiments made by Hunziker,[1] the percentage of milk-fat in the skimmed milk separated from cream by these gravity methods of cream separation is as follows: water-dilution method, .68 of 1 per cent of fat; shallow-pan method, .44 of 1 per cent of fat; deep-setting method, .17 of 1 per cent of fat.

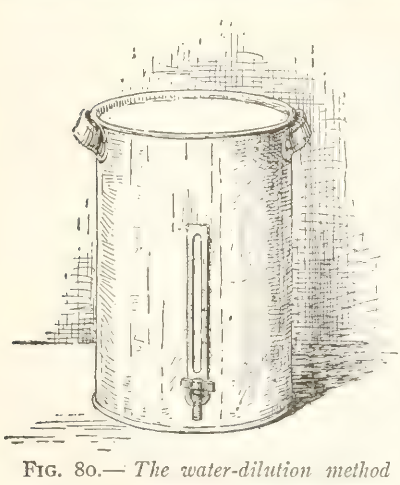


FIG. 80.— *The water-dilution method*

This loss of milk-fat from the milk of a single cow giving 5000 pounds of milk each year, is shown in Figure 81. The skimmed milk usually amounts to about eighty-five per cent of the whole milk, which in this case would mean eighty-five per cent of 5000 pounds of whole milk, or 4250 pounds of skimmed milk. In the manufacture of butter certain amounts of moisture, salt, and casein are incorporated. Thus it is possible to make more butter from a certain amount of milk-fat than there was original fat. This in-

[1] The hand separator and the gravity systems of creaming. By O. F. Hunziker. Purdue University Agricultural Experiment Station. Bulletin 116.

crease is known as overrun. In the computation shown in Figure 81 allowance was made for an overrun of one-sixth of the original amount of milk-fat.

According to the statements given, if the price of butter were 30 cents a pound there would be an annual loss of $9.60 on each cow by the use of the water-dilution method, and $2.25 on each cow by the use of the deep-setting method. These losses are computed on the basis of the amount of milk-fat lost through the use of these methods as compared with the amount lost if a modern centrifugal separator were used.

SEPARATION BY CENTRIFUGAL FORCE

Centrifugal force acts in direct proportion to the weight of matter. The specific gravity of skimmed milk is greater than that of cream; therefore

FIG. 81.— *A comparison of the amount of butter lost in the skimmed milk from one cow producing 5,000 pounds of milk in one year, by the use of different methods of cream separation. Reading from left to right: water-dilution method, 33 pounds; shallow-pan method, 22 pounds; deep-setting method, 8.5 pounds; centrifugal method, 1 pound*

the skimmed milk is forced from the center of a separator bowl with a greater velocity, and the cream is crowded, or concentrated, toward the center of the bowl.

The purpose of the bowl devices in separators

There is a device in all separator bowls which guides or feeds the whole milk into the region of the greatest centrifugal force. With one exception, all centrifugal separators with which the author is familiar have internal bowl parts, such as disks, cones, blades, and the like. The purpose of these parts is to form pathways for the skimmed milk and cream to pass each

other. It must be remembered that these devices do not cause separation; they simply aid the centrifugal force. The introduction of these devices has made possible the use of a much smaller bowl for a given capacity. In the evolution of improvement in this direction, the bowls of cream separators have become lighter, and they are consequently easier to turn and to handle. The separator referred to as being the one exception has a long and narrow tube-like bowl in the smaller sizes in which it is manufactured.

The regulation of the percentage of fat in cream

The richness, or the percentage of fat, in cream derived from whole milk by the use of a centrifugal separator is regulated by either a cream screw or a skimmed milk screw. Two main facts should be remembered in this connection by the person operating a centrifugal separator when he sets either of these screws. The first of these facts is that the richness of the cream depends on the point in the bowl from which it is drawn. The richest cream is that which is drawn from the center of the bowl, and the richness decreases as the distance from the center of the bowl increases. The other fact is that the smaller the proportion of cream is to skimmed milk, the richer the cream is in fat. The percentage of fat in cream should be regulated according to the use that is to be made of the cream. Ordinarily for churning purposes, the proportion of cream to skimmed milk should be approximately one to eight, or one to ten. For example, in one hundred pounds of whole milk testing four per cent fat, there are four pounds of fat (100 pounds x 4 per cent = 4 pounds fat). In ten pounds of cream that have been separated from the given 100 pounds of whole milk and that test forty per cent fat, there are approximately four pounds of fat (10 pounds x 40 per cent = 4 pounds). If there is no waste,

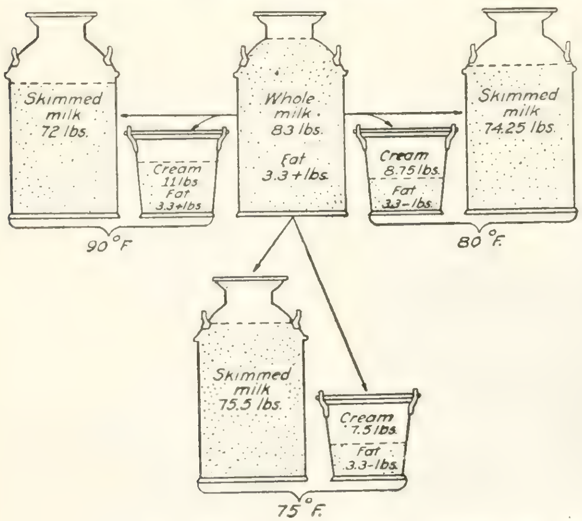


FIG. 82.— *A comparison of the amounts of cream from one can of whole milk separated at different temperatures. The pounds of fat in the whole milk and in each pail of cream are practically the same*

there are ninety pounds of skimmed milk (100 pounds − 10 pounds = 90 pounds). The ratio of the cream (10 pounds) to the skimmed milk (90 pounds) is one to nine. If cream having a lower percentage of fat is desired, this ratio will be less. Cream with a lower percentage of fat is often used on the table and for making ice cream. In separating cream for these purposes the ratio of cream to skimmed milk should be about one to four, to five, or to six, depending on the percentage of fat in the whole milk. It is readily seen that a comparison of the quantities of cream and skimmed milk obtained in separation gives a close approximation of the percentage of fat in the cream. These ratios are shown in Figure 82, which also gives the results of temperature study of one separator. This topic is discussed later in the lesson. The figure makes clear the fact that if cream with a high percentage of fat has been separated, no more fat has been obtained from a given amount of whole milk than if the cream has a low fat content, for the weight of the cream is less.

If a well-made centrifugal separator is operated properly, it will separate cream containing as high as forty-five to fifty per cent of fat, and there will be only the normal loss of fat in the skimmed milk. Usually it is not desirable that cream should contain more than forty to forty-five per cent of fat, for very rich cream is wasted by sticking to cans, dippers, and other utensils, and it is difficult to obtain a representative sample of it for testing.

The fat content of cream cannot be controlled to a definite percentage by the regulation of the cream screw or the skimmed milk screw, and the percentage of fat in cream will not remain constant even when these screws are not changed. There are certain factors that affect the percentage of fat in cream to a greater or less degree as it is being separated.[2] The effect of these factors on the percentage of fat in skimmed milk is not so noticeable as their effect on the percentage of fat in cream.

Factors that affect the percentage of fat in cream and in skimmed milk separated by a hand centrifugal separator

The temperature of the whole milk.—The temperature of milk that is being separated should be such that the milk will flow easily, in order to facilitate rapid and thorough separation of the cream and the skimmed milk. The temperature does not need to be as high as the body temperature of a cow, which is normally about 101.4° F.; however, if the separation is done on the farm, milk should be separated as soon as possible after it has been milked, especially in the winter. In creameries and in other places where milk is separated after it has cooled, the temperature of the milk should be raised to 85° to 90° F. before it is separated. The temperature of the

[2] A more complete study of the conditions that affect cream separation is recorded in Bulletin 360 of the Cornell University Agricultural Experiment Station. This bulletin will be ready for distribution July 15, 1915.

whole milk has a direct effect on the percentage of fat in the cream and the skimmed milk. In order to show the exact effect of variation in temperature, tests of cream and skimmed milk that had been separated by five different types of separators were made. The results of these tests are given

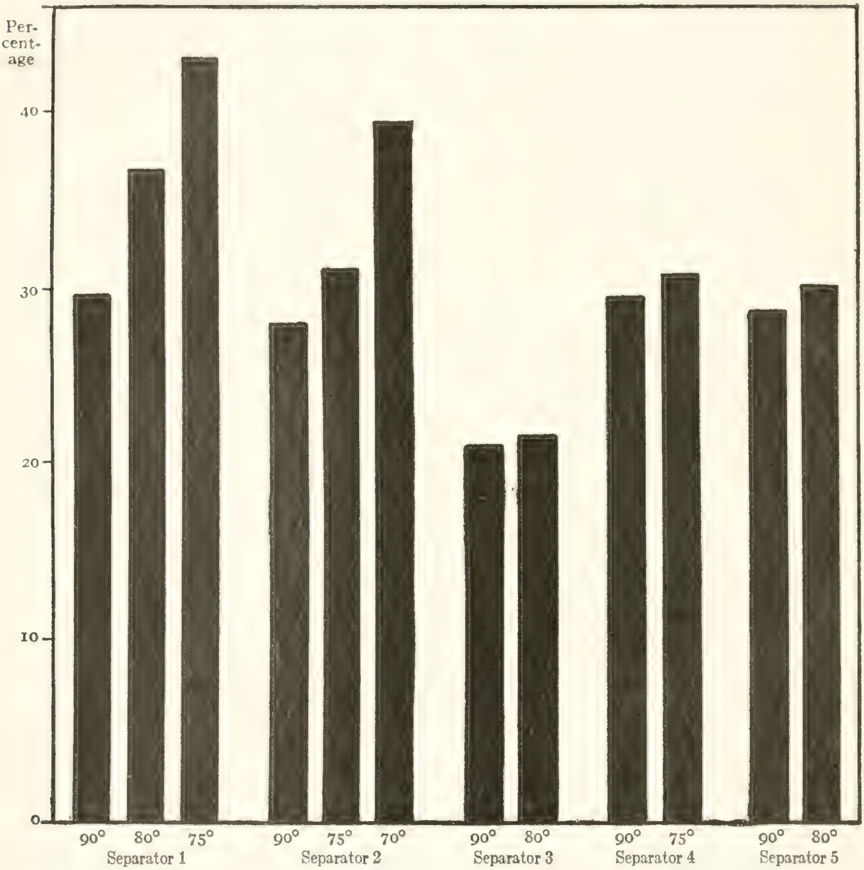


FIG. 83.—*A diagram representing percentage of fat in cream as influenced by the temperature of the whole milk. Temperatures are expressed in degrees Fahrenheit*

in Figures 83 and 84. The cream and the skimmed milk separated by all of the separators were not affected alike by different temperatures. From a study of Figure 83, it may be thought that there is an advantage in having the whole milk at a low temperature because the cream from two of the separators contained a much higher percentage of fat when the temperature was low than when it was normal. However, the loss of fat in the skimmed milk was comparatively greater, as shown in Figure 84. When the amount of fat in the skimmed milk does not vary greatly, the amount of cream from

a certain quantity of whole milk decreases in direct proportion to the increase of the amount of milk-fat in the cream. This fact is clearly brought out in Figure 82. It should be noticed in Figure 82 that the weight of the fat in the whole milk and in all three pails of cream was approximately the same, but that there was a distinct variation in the weight of the cream.

The rate of speed.—The centrifugal force that causes separation in the modern separator is produced by the rapid revolving of the bowl. The separator bowl about four inches in diameter makes approximately nine thousand revolutions per minute. Thus a point on the circumference of the bowl travels at the rate of somewhat less than two miles per minute.

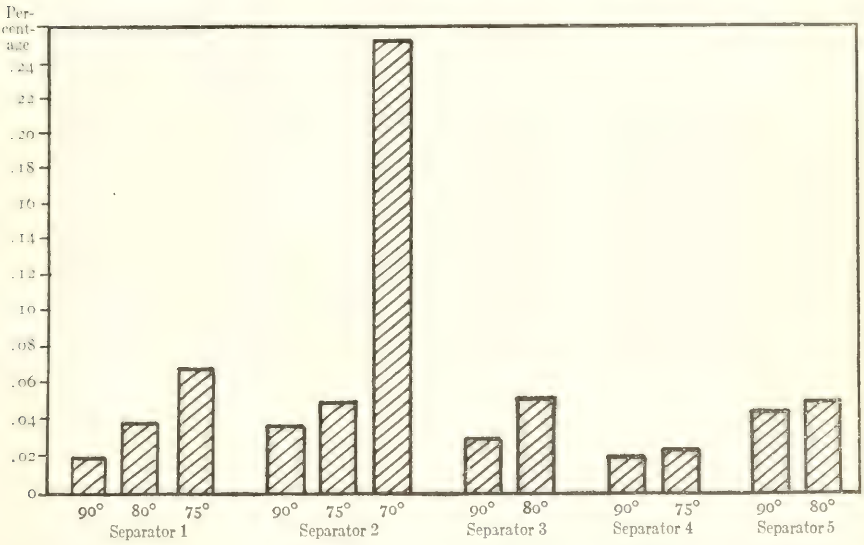


FIG. 84.—*A diagram representing percentage of fat in skimmed milk as influenced by the temperature of the whole milk. Temperatures are expressed in degrees Fahrenheit*

The number of turns of the crank necessary to effect thorough separation of milk varies for different machines from forty-five to sixty-five turns per minute. A slight variation in the speed of the crank has a great effect on the velocity of the bowl; and care must be exercised in producing a uniform speed, if uniform results are to be expected. The effect of a decrease of six or ten revolutions of the crank per minute on the percentage of fat in the cream is considerable, as shown in Figure 85; and the effect on the percentage of fat in the skimmed milk is very slight, as shown in Figure 86. A slight variation in the speed of the crank does not affect the amount of fat separated from the whole milk, but it does affect the quantity of the cream separated.

All hand separators have the number of revolutions of the crank necessary for efficient separation marked on the crank, and all power separators have instructions as to the proper rate of speed at which they should be operated. Naturally the manufacturer is careful not to state a rate of speed for his separator that will give results just above the border line of poor separation. If these instructions given by the manufacturers are followed carefully, the separation of milk will be found to be thorough. The fact is, however, that the rate of speed may drop several hundred revolutions of the bowl below the number designated for correct speed, and

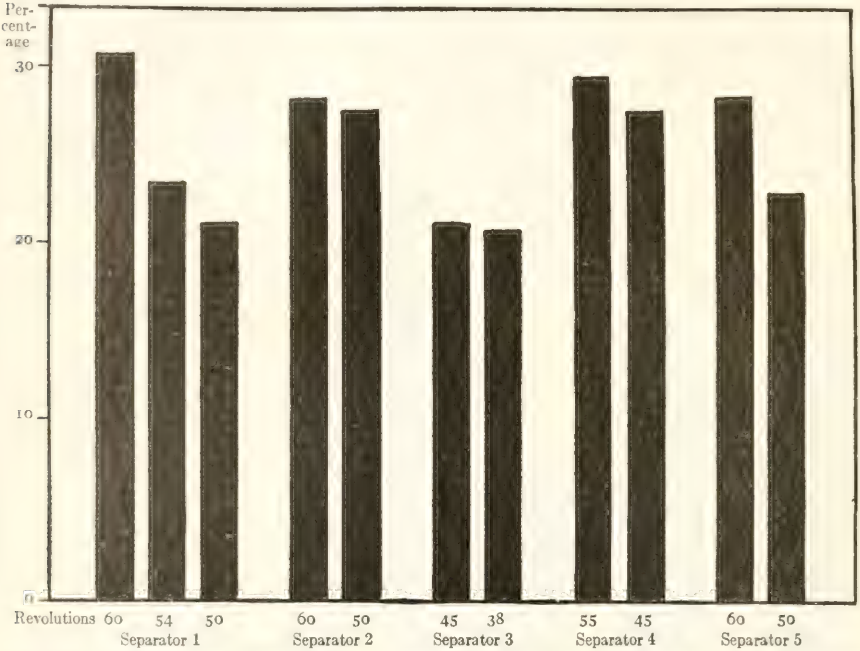


FIG. 85.—*A diagram representing percentage of fat in cream as influenced by the number of revolutions of the separator crank per minute*

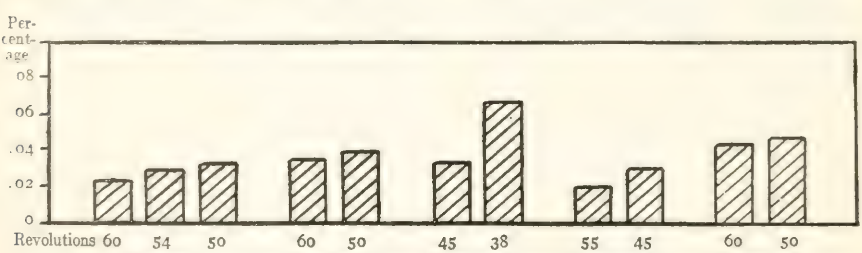


FIG. 86.—*A diagram representing percentage of fat in skimmed milk as influenced by the number of revolutions of the separator crank per minute*

still the skimmed milk will contain approximately the same percentage of milk-fat as when the bowl is revolving at the so-called normal speed. In the case of the hand separators this amounts to five or ten revolutions of the crank less than the number given for normal speed.

Percentage of fat in whole milk.—The percentage of fat in whole milk is variable. In this respect the milk from individual cows may vary as much as two or three per cent from one milking to another, and yet the cow may appear to be in a normal condition. The fat content of the milk of a herd is not so variable as the fat content of the milk from a single cow. Other things being equal, the larger the herd is, the smaller is the variation of the fat content of the milk. The difference in the percentage of fat in milk is not so great from day to day as it is from milking to milking, and this variation is still less from week to week and from month to month. The influence of a variation in the fat content of the whole milk on the percentage of fat in the cream is shown in Figure 87. The percentage of fat in the cream is in almost direct proportion to the percentage of fat in the whole milk.

FIG. 87.—*A diagram representing the percentage of fat in cream as influenced by the percentage of fat in whole milk. The figures on the left of the diagram represent percentage of fat in cream, and those underneath represent percentage of fat in whole milk*

Variation in the quantity of whole milk or in the amount of liquid used for flushing.— There is a variation in the quantity of milk from one milking to another, and this causes a variation in the amount to be separated from one time to another. There are very few persons operating separators who use a fixed amount of skimmed milk or water for flushing the separator bowl. For the hand machines two or three quarts of flushing material are sufficient. The amount of flushing material that goes into the cream is only a small

percentage of the total, and it affects only slightly the percentage of fat in the cream. Under average conditions these factors are not of much importance if approximately the same quantities of milk and flushing material are used each time.

Slime deposit.— If the passages for the cream and the skimmed milk in a separator are closed or partly closed by slime deposit, the efficiency of the separator will be affected. The slime deposit is composed of fibrin from

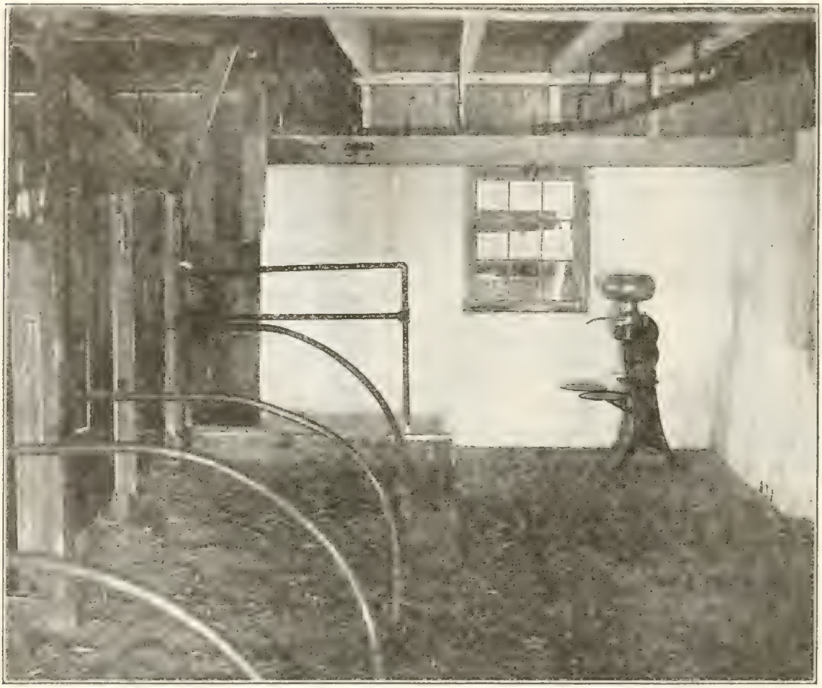


FIG. 88.— *The barn is not a desirable location for a separator*

the milk and of dirt, and it accumulates in a greater or less amount even from the best of milk. Generally, this accumulation is not sufficient to cause excessive loss of fat in the skimmed milk if the separator is run the length of time of the average separation. The length of the period of separation will be considered later in the lesson.

ADVANTAGES OF THE CENTRIFUGAL METHOD OF CREAM SEPARATION OVER THE GRAVITY METHODS

1. Ordinarily, fewer utensils are used in the centrifugal method than in the gravity methods. If the herd is composed of only two or three cows, this may not be true; but if there are eight to ten cows, it is true.

2. The skimmed milk that has been separated from the cream by a centrifugal separator is fresher and warmer for use in feeding stock than the skimmed milk produced by the old methods. This may not be an advantage in some cases; however, in no case is it a detriment.

3. The fat, which is the most valuable constituent of milk, is immediately obtained in a small quantity and is therefore more readily cooled and

FIG. 89.— *A woodshed may be a suitable place for a separator*

otherwise handled. If the old gravity methods of separation are used, about thirty-six hours are required for the cream to "rise."

4. Cream separation by the centrifugal method is more thorough than by the gravity methods because less milk-fat is left in the skimmed milk.

FACTORS TO BE CONSIDERED IN BUYING A CENTRIFUGAL SEPARATOR

A question that comes to the purchaser of a cream separator is, "Which is the best separator?" Since improvements in the construction of separa-

tors are being made constantly, it is impossible for any one person to collect sufficient data to determine this point. However, there are a few points concerning separators that should help to guide the buyer of one. The following is a list of these points:

1. *Size.* — Ordinarily for farm use, a separator should be of such a size or such a capacity that it will separate the milk produced by a herd at one milking in one-half hour or less time. Usually a farmer's time is worth enough to make it cheaper for him to buy a separator that is large enough to do his separating in the proper length of time than it is for him to use more of his time in operating a smaller machine.

There are conditions on the farm that must be considered in the selection of a separator of proper size. It may be the plan of the farmer to increase or

FIG. 90.— *A convenient and inexpensive building in which to make farm butter. The gasoline engine is located in the lean-to*

decrease the size of his dairy herd, and, since a separator will wear for many years, these plans for the future must be borne in mind. In buying a separator for creamery use, both the maximum and minimum amounts of milk for different seasons of the year should be considered.

2. *Supplies for repairing purposes.*— The obtaining of supplies without difficulty is one of the most important considerations in buying a separator, and this point should be especially emphasized in localities where transportation facilities are rather limited. Most of the companies manufacturing cream separators have supply centers in many sections of the country, so that in case of a breakdown new parts can be quickly obtained. Some dealers in separators carry a stock of supplies.

3. *Other factors.*—The other factors to be considered need but little discussion. The following ones are mentioned so that the prospective buyer of a separator may have a fairly complete list of the points to be considered.

The factors are: preference to certain makes; price; amount of power required for operation; accessibility to parts and number of parts to be cleaned; simplicity of entire construction; indication of durability; efficiency, as shown in the amount of milk-fat left in the skimmed milk and as shown in the ability of the separator to separate the guaranteed number of pounds of whole milk per hour.

THE LOCATION OF A CREAM SEPARATOR

The location of a separator in a creamery is not so difficult a problem as the finding of a suitable place for a separator on some farms. The two main

FIG. 91.—*A satisfactory building in which milk may be handled in a sanitary manner, and a good location for a separator*

considerations in either case are sanitation and convenience. The separator should be placed in such a position that during the period of separation the milk and the cream will not come in contact with bad odors and sources of contamination from microorganisms. In creameries or other large dairy plants, no such sources of trouble should exist. On farms separators are often placed in barns and in some cases behind the cows, as shown in Figure 88. Under no circumstances should a separator be placed in such a position, even though it is convenient to the cows, and to the calf pens and the pigpens where the skimmed milk is fed.

There are probably more hand separators located in the kitchen than in any other one place on the farm, especially during the winter. The kitchen is a convenient location for a separator because it is a comfortable place in which to work, and it is near the source of hot water, which is absolutely essential in the proper care of dairy products. The woodshed is also usually near the source of hot water and is likewise a convenient place for a separator. Either the kitchen or the woodshed may be used with satisfactory results if the floor is sufficiently solid to prevent vibration of the machine

FIG. 92.—*Interior view of the building shown in Figure 91*

when it is in operation, and if proper precaution is exercised in ventilation and in the prevention of such odors as those coming from burned bacon, cabbage, onions, and the like. The one great objection to handling dairy products in the kitchen, which is often the living room of the house, is caused by the danger of spreading pathogenic organisms, in case any member of the family has a contagious disease. It is therefore preferable to have the separator in a separate room or building, even if it is necessary to take the movable parts to the kitchen for cleaning.

A separate milkhouse, or dairy building, is recommended in cases where the dairy herds are larger than the average, which is probably less than ten

cows if cream is separated on the farm; in cases where cream of a special grade is being produced; in cases where conditions in the house are too crowded; or in cases where it is desirable to use a power-driven separator. Examples of neat and simple buildings are shown in Figures 90 and 91. The dairy house in Figure 90 is a plain building with unfinished interior. It is twelve feet by sixteen feet in size, and the cost of construction, according to the owner's statement, was about $65. The drainage is through a trap into a drain leading to a gravel bed. This building houses a complete outfit for making butter on the farm, including a cream separator. The building in Figure 91 is a little more expensive and is better finished than the building just described. The view of it in Figure 92 shows a brick veneer that makes cleaning a little easier than when the interior of the building is left unfinished. The size of this building is ten feet and six inches by fourteen feet.

SUGGESTIONS IN REGARD TO THE PLACING AND THE OPERATING OF A CREAM SEPARATOR

1. *The placing of the separator.*— A centrifugal separator is a very delicate piece of machinery. It should be carefully placed in a level position on a solid and sanitary base. It should be held in place firmly but not rigidly. It is therefore advisable not to screw the lag screws down tight unless it is so directed by the manufacturers in the printed instructions that accompany each machine.

2. *The adjustment of the parts of the bowl.*— The bowl devices of a separator must be placed in the bowl in proper position so that the bowl will run with perfect poise. Many separators are turned with difficulty because the bowls are not properly balanced, and a separator cannot do efficient work when the bowl is not in proper working order. The rubber ring that is used to seal the bowl must be sufficiently soft in order to make the joint milk-tight. If the rubber ring is hard, it should be held in warm water until it is softened.

3. *The oiling of the separator.*— Constant care of a separator is necessary in order to supply the proper kind and amount of oil. Manufacturers of separators give directions concerning this subject.

4. *The temperature of the whole milk.*—Milk that is to be separated should be of a proper temperature. This is essential to the efficient operation of the separator, and this fact is brought out in Figures 83 and 84.

5. *The place for the milk when the separator is started.*—The supply tank should be filled with whole milk before the separator is started.

6. *The cream container and the skimmed milk container.*—A pail and a milk can may be used as receptacles under the skimmed milk spout and the cream spout, respectively.

7. *The rate of speed.*— The rate of speed at which the separator is operated is important, as shown in Figures 85 and 86. The subject is discussed in connection with these figures.

8. *The inflow.*—When a separator is running at the proper rate of speed, the gate of the supply tank should be opened wide so that the proper amount of milk will flow into the bowl. If this is not done, the separator is not likely to separate at its rated capacity. The float, if working properly, will maintain a uniform flow of milk into the bowl.

9. *The flushing of the bowl.*—The bowl should be flushed with enough skimmed milk or water to force the cream out of it. Usually skimmed milk should be used for this purpose because no additional microorganisms can get into the cream and the skimmed milk through its use; whereas if water is used, there might be some bacteria present that would cause the cream and the skimmed milk to become tainted with undesirable flavors, even though the water is good for drinking purposes. Usually two quarts of skimmed milk run through the bowl while it is revolving at the full rate of speed is sufficient for flushing, but the amount depends more or less on the size of the separator bowl, the percentage of milk-fat in the cream, and the temperature of the whole milk. If the cream is rich in milk-fat and the temperature of the whole milk is low, some warm water, having a temperature of about 120° F., should be run through the bowl in order to carry out the milk-fat. This should be done after the bowl has been flushed with skimmed milk. Care should be exercised not to use so much water that the cream will be greatly diluted.

10. *The setting of the cream screw or the skimmed milk screw.*—In case the percentage of fat in the separated cream has not been regulated, it is a good plan to run water through the separator bowl while it is revolving at the proper speed. The screws should be set so that about one-eighth or one-tenth of the water should flow from the cream spout, if the cream is to be used for churning purposes. A more complete discussion of this subject is given on page 1874.

SUGGESTIONS CONCERNING THE CLEANING OF A SEPARATOR

1. *Rinsing the parts of a separator.*—The interior parts of the separator that have come in contact with the milk should be rinsed with lukewarm or cold water. If hot water is used, the casein of the milk is likely to be precipitated on the utensils, and it is rather difficult to remove after it has hardened because it adheres very closely.

2. *Cleaning the parts of a separator with washing solution.*— Water alone is not sufficient to use for cleaning a separator. A very good washing solution may be made by dissolving about a level tablespoonful of washing powder or a sufficient amount of soap in a gallon of water that is as hot as

the hands can bear. The solution should be strong enough to remove all grease from the parts of the separator; and a brush, not a cloth, should be used in washing them, for the use of the brush is a more sanitary practice.

3. *Thorough scalding of the parts of the separator.*—All removable parts of the separator should either be plunged in water that is near the boiling point and kept there for at least a minute, or be thoroughly steamed. If hot water is used, it will kill most of the bacteria on the parts of the separator, will rinse off the washing solution, and will give sufficient heat to dry the parts. Do not use a cloth for drying these parts, for the bacteria on it are likely to be smeared on the clean surfaces. The hot-water receptacle should be large enough to hold a pail while it is being scalded, and it should be suitable for placing on the stove or over a steam jet. If the dairyman does not have such a receptacle, boiling water may be poured over the parts of the separator; however, this is not so effective as plunging the utensils beneath the surface of the boiling water. After the parts are dry, they should be placed where dust and flies cannot reach them.

The directions given for cleaning a separator should be followed in cleaning all of the utensils that are used in the care and handling of milk. Cleanliness concerning these utensils cannot be overemphasized.

CORNELL STUDY CLUBS

Cornell study clubs are local organizations of farmers and their families, which aim to promote the study of Cornell reading-course lessons. One of the chief benefits of these clubs is that they furnish an opportunity and an incentive for study. Often a helpful lesson will reach a farm home at a time when the members are too busy to give it attention, and it is soon forgotten. If, however, a special time is set aside for the study of reading-course lessons at a club, it is likely that much more reading will be accomplished. The secondary purpose of Cornell study clubs is to increase a neighborly feeling in the community and to offer an opportunity for an exchange of thought on subjects of common interest. In the meetings of a club the members should find enjoyment in an interchange of ideas and a training for free and orderly self-expression.

The organization of a Cornell study club can be easily effected even if at first only half a dozen persons desire to form a group. The president and the secretary of the club should be chosen, and the dates and places for meetings decided on. The meetings should be held frequently enough to maintain an active interest in them; regularly every two weeks during the fall and winter is usually considered sufficiently often. If it is not advisable to meet every fortnight in spring and summer, monthly meetings are suggested. Study clubs hold their meetings in churches,

grange halls, and at the homes of the members. The meetings should proceed under a definite order of business, the programs should be planned carefully several weeks in advance, and the leaders should be selected and held responsible for the success of the meetings. The supervisors of the reading-courses will be pleased to suggest reference books and bulletins to leaders who desire additional material for study. Reading-course lessons should be obtained by the secretary of the club and distributed to the members at least one week in advance of a meeting, so that the members may be prepared for a general discussion, which should follow the opening talk given by the leader.

Each study club should first become fully informed as to the material available in the two reading-courses. The reading-course for the farm discusses farm practices and important rural problems. The reading-course for the farm home takes up such household subjects as sanitation, foods, household management, and household furnishing. If the study club is composed of men, the lessons should be related to local agricultural conditions, and should deal with operations in progress at the time of year in which they are being discussed. Valuable suggestions for a club composed of women will be found in *Cornell Study Clubs*, Cornell Reading-Course for the Farm Home, Vol. I, No. 13. A number of Cornell study clubs are promoting very successfully the study of the two reading-courses, and are reaching both the men and the women of the community. Some of the clubs discuss farm subjects and farm home subjects on the same program; others divide into two groups for separate discussions, and hold the remainder of the program in common. If a club desires to undertake this more general organization, it may prove mutually advantageous to men, women, and young people in many practical ways. Moreover, such a club may have the inspiration of a larger membership and may exert a wider influence.

Cornell study clubs may bring about cooperation in matters of public concern, and may grow to be influential factors in promoting community welfare. They may also prove of financial benefit by becoming agencies for cooperative buying and selling. The success of the Cornell study club must depend principally on local leadership. It is hoped that public-spirited persons will find in the Cornell study clubs a means of improving the agricultural and social conditions in their communities. Visits from representatives of the college will be arranged when possible. Cordial cooperation in establishing study clubs may be obtained by writing to the Supervisor, Reading-Course for the Farm, or the Supervisor, Reading-Course for the Farm Home, College of Agriculture, Ithaca, New York.

Whenever desired, study clubs may be conducted in connection with the educational work of granges, churches, schools, and local agricultural

societies. The following three ways are suggested in which reading-course lessons may prove valuable to a study club or to any other organization:

1. For study by the entire membership previous to a general discussion at a regular meeting.

2. To aid leaders in preparing for a program at a regular meeting.

3. For reference. A set of available lessons may be obtained for use by a study club or for the library of any church, school, grange, or other organization.

Bulletins and circulars of the Cornell University Agricultural Experiment Station may also be obtained for the above purpose by writing to the Mailing Room, College of Agriculture, Ithaca, New York.

AVAILABLE READING-COURSE LESSONS FOR THE FARM, ARRANGED BY SERIES

Residents of New York State may register for one or more of the series mentioned below by addressing The Cornell Reading-Course for the Farm, College of Agriculture, Ithaca, New York.

SERIES		LESSONS
The soil	74	Introduction to the principles of soil fertility
	42	Tilth and tillage of the soil
	50	Nature, effects, and maintenance of humus in the soil
	70	Soil moisture and crop production
	78	Land drainage and soil efficiency
Poultry	80	Incubation
	10	Feeding young chickens
Rural engineering	8	Knots, hitches, and splices
	*59	Sewage disposal for country homes
Farm forestry	12	The improvement of the woodlot
	28	Recent New York State Laws giving relief from taxation on lands used for forestry purposes
	40	County, town, and village forests
	62	Methods of determining the value of timber in the farm woodlot
The horse	46	Feeding and care of the horse
	56	Practical horse-breeding

*Lesson for the Farm Home.

SERIES		LESSONS
Dairying	16	Practical dairy problems
	32	Composition of milk and some of its products
	54	The dairy herd
	60	Farm butter-making
	82	Cream separation
	84	The production of clean milk (in press)
Fruit growing	22	The culture of the currant and the gooseberry
	36	Culture of red and black raspberries and of purple-cane varieties
	48	Culture of the cherry
	52	Culture of the blackberry
	72	Culture of the grape
Farm crops	20	Alfalfa for New York
	24	The rotation of farm crops
	66	Meadows in New York
Stock feeding	26	Computing rations for farm animals
Vegetable gardening	34	Home-garden planning
	58	Planting the home vegetable garden
Plant breeding	38	Principles and methods of plant-breeding
	44	Methods of breeding oats
	68	Improving the potato crop by selection
Country life	64	The rural school and the community
	76	Birds in their relation to agriculture in New York State

The above list is correct to March 15, 1915. The demand may at any time exhaust the supply of particular numbers. Requests will be filled as long as the supply lasts.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, NewYork

VOL. IV. No. 82 | FEBRUARY 15, 1915 | DAIRYING SERIES No. 5

CREAM SEPARATION

DISCUSSION PAPER

A discussion paper is sent with each reading-course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading-course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, the reader should sign and return this discussion paper, whether the questions are answered or not.* By means of reading-course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading-course work, and also for names and addresses of residents of New York State likely to become interested on receipt of information.*

(In answering questions, attach additional paper if needed and number the answers.)

1. Are you using one of the gravity methods of skimming cream? If so, what one are you using, and what percentage of fat is left in the skimmed milk?

2. If you are using a gravity method, are you experiencing difficulty in churning because of a low percentage of fat in the cream?

3. If you are using one of the gravity methods, is the cream sold for consumption as sweet cream? If so, have you experienced any difficulty in keeping it sweet?

4. Are you using a modern centrifugal separator? If so, what percentage of fat is left in the skimmed milk?

5. Have you found a variation in the percentage of fat in the cream and in the skimmed milk from one period to another? If so, how great was the variation?

6. Are you able to attribute the variations noted in question 5 to any conditions of separation? If so, what are the conditions?

7. Where is your separator located?

8. Is the base of your separator level? Of what material is this base composed; and is it easily cleaned?

9. What are the important considerations to be observed in washing the separator?

10. What do you think is the most important consideration in buying a separator?

Name..

Address..

Date..

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 84 | MARCH 15, 1915 | INSECT SERIES No. 1

INSECTS INJURIOUS TO THE FRUIT OF THE APPLE

C. R. CROSBY AND M. D. LEONARD

NEARLY five hundred species of insects have been reported as feeding on the apple; however, a relatively small number of species are responsible for the heavy losses. In this lesson are discussed only the more important insects that attack the fruit itself: namely, codling moth, apple maggot, apple redbugs, fruit-tree leaf-roller, and green fruit-worms. The San José scale often stunts the fruit and disfigures it with red spots; but, as the more important injury is to the twigs and branches, this insect will be discussed in a future lesson. The plum curculio also causes the fruit to become knotty and deformed; it will be treated as a plum pest.

Owing to the stringent requirements of the apple packing law of 1914, fruit growers have been forced to take a greater interest in producing fruit free from all blemishes caused by insects. In order to produce clean fruit it is necessary that the fruit grower should be familiar with the various types of injury caused by the more important insect enemies of his crop, and that he should be acquainted with the more important facts in their life history. Most injurious insects have at least one vulnerable point in their life cycle when it is possible to do the most effective work in destroying them. Familiarity with the various stages of each pest is necessary in order to ascertain which are these weak spots and when they occur.

THE CODLING MOTH

Carpocapsa pomonella Linnæus

For nearly a century the codling moth has been the most serious insect enemy of the apple in New York. A native of Europe it was introduced into New England in the early part of the eighteenth century, whence

it gradually spread westward, reaching California about 1874. The losses caused by the codling moth are often severe; from one-fourth to one-half of the crop in the unprotected orchards of New York State is sometimes destroyed in this way. As a rule the percentage of infested apples is greater during years when there is a short crop than when the yield is large. The explanation of this is simple: when the crop is small there are more caterpillars in proportion to the number of apples. The estimated apple crop for New York State in 1914 was 6,500,000 barrels. Assuming that one-fourth of the crop was destroyed by the codling moth, the production of that year would have been 8,666,666 barrels. Thus the loss was 2,166,666 barrels, or $2,166,666, estimating these apples at $1 per barrel. According to the census of 1910 there were 11,248,203 bearing apple trees in New York State. It is estimated that 40 per cent of these trees are sprayed at least once for the codling moth. The cost of this work is not far from 10 cents per tree, or about $45,000. The sum of the loss of the fruit and the cost of spraying necessitated by the codling moth is at least $2,211,500, which represents the annual tax levied on New York State by this insect.

Owing to its great economic importance the codling moth has received more attention at the hands of entomologists than any other insect injurious to fruits, and the facts of its life history have been worked out with greater detail. Ranging throughout North America wherever the apple is grown, it has adapted itself to the variations in climate by modifying the length and number of generations produced annually. In New York State there are one brood and a partial second brood annually, but in the Lake Champlain district the second brood is so small as to be of little importance. The insect is, therefore, not so destructive in this State as it is farther south where the longer growing season permits more generations to develop.

Life history.— In New York the codling moth passes the winter as a full-grown caterpillar, curled up in a tough silken cocoon under flakes of bark or in crevices in the trees. While the greater number find suitable winter quarters on the trees, a few occasionally secrete themselves in piles of rubbish, in adjacent fences, or in other dry, protected places. Occasionally on young smooth-barked trees the caterpillars do not find a suitable hiding place on the trunk or branches, and they may then be forced to spin their cocoons under stones or in the space between the trunk and the soil; it is very doubtful if any of the caterpillars in these situations survive the winter. The cocoon measures from one-half to five-eighths inch in length and is composed of a thin tough layer of silken thread, in which is mixed bits of the bark or wood to which it is fastened. It is lined with white silk and the outside is rendered inconspicuous by the addition of bits of dirt and bark.

With the first warm days of spring the caterpillars begin to transform to dark brownish pupæ. The transformation usually takes place within the cocoon in which the caterpillar spent the winter, but in case the cocoon is in a deep crevice or under a tight flake of bark, the caterpillar may leave its winter quarters to construct a new cocoon nearer the surface; in the latter pupation takes place. Sometimes the caterpillar, without leaving the cocoon, merely opens the end and spins a silken tube out to the surface through which the moth is easily able to gain its freedom.

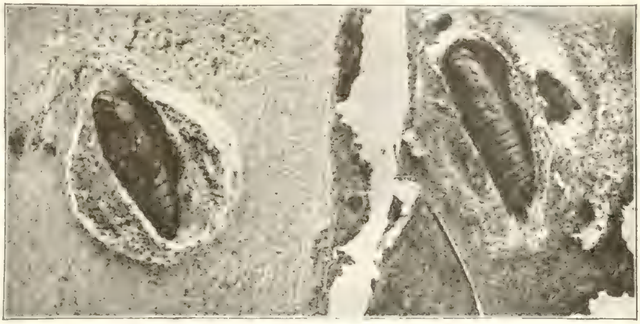


FIG. 93.— *Pupæ of codling moth, in their cocoons. Enlarged*

The pupa (Fig. 93) is about one-half inch in length; it is at first yellowish in color, but later it turns brown. The rate at which the caterpillars transform to pupæ depends considerably on the temperature, and pupation is greatly retarded by cold, backward weather. The average time spent in the pupa state is about four weeks for the spring brood.

The moths emerge during a period of several weeks, but the time at which the greater number appear varies considerably with the season; it is, however, usually about two weeks after the blossoms fall. The moths with wings expanded measure about three-fourths of an inch. The front wings have the general appearance of watered silk, which effect is produced by alternating irregular lines of brown and bluish gray. Near the hind angle is a large light brown area, bounded on the inner side by an irregular chocolate brown band, and crossed by two similar bands of a coppery or golden color in certain lights. The hind wings are coppery brown, darker towards the margin. The two sexes are very similar in appearance (Fig. 94).

FIG. 94.—*Codling moth, enlarged*

If the weather is warm, egg laying begins in from three to five days after the moths have emerged; but if the weather is cold, it may be deferred for some time. The average life of the moth is about ten days, and each female lays from thirty to over one hundred eggs. The glistening, flat, oval, scalelike eggs are about half the size of a pinhead in diameter (Fig. 95). Those of the spring generation are laid mostly on the leaves, though a few are sometimes placed on the fruit and branches. Though the eggs are deposited throughout a period of several weeks, the greatest number are laid about three weeks after the blossoms fall. The eggs of the spring brood hatch in from six to ten days. In general in New York, though the condition of the weather will alter this somewhat, the earliest laid eggs will begin to hatch about three weeks after the petals fall, and hatching will be at its height about a week later, or about four weeks after the petals fall. This point is important from the standpoint of control and should be borne well in mind.

FIG. 95.— *Codling moth egg, greatly enlarged*

The newly hatched caterpillars are about one-sixteenth inch in length and semitransparent whitish in color with a blackish plate just behind the head and another at the hinder end, which are known respectively as the thoracic and anal shields. On the back are small blackish tubercles, which become less distinct with age. These little larvæ at first feed to a slight extent on the leaves, but most of them make their way directly to the young fruit where they begin feeding within the calyx lobes. Seventy per cent or more of the caterpillars enter the apples at the blossom end. It is this fact that is taken advantage of in spraying for the first brood of codling moth. After feeding for a short time in the calyx cavity (Fig. 96) the larva burrows to the core, eats the seeds, and hollows out a large cavity, which becomes filled with masses of excrement loosely webbed together with silk (Fig. 97). The length of time spent in the apple by each larva varies considerably, but averages about four weeks for the first brood. The larva then burrows to the surface and makes an exit hole, usually on the side of the apple, which it keeps plugged with frass (Fig. 98). When full grown the larva measures about three-fourths inch

FIG. 96.— *Young codling moth larva feeding in calyx cavity*

in length and is pinkish white in color with the head darker brown and the thoracic and anal shields lighter brown (Fig 99).

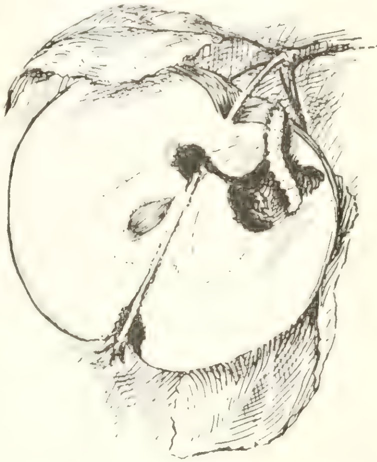


FIG. 97.— *Full-grown codling moth burrowing in an apple*

Most of the larvæ come out of the fruit before it falls, and crawl down the branches until they find a suitable place in which to spin cocoons. The caterpillars of the spring brood are divided into two classes: first, overwintering caterpillars, those that do not transform to pupæ until the following spring; second, transforming larvæ, those that transform during the same season producing another generation. The larvæ that winter over spin thicker, stronger cocoons than those that are destined to transform during the same season. The cocoons of the transforming larvæ are used only for a short time, are therefore more loosely woven, and are provided with an exit tube for the moth. In New York the transforming larvæ, as a rule, leave the fruit before August 1, but they comprise only a small percentage of the total number that spin cocoons before that date. The moths of the second brood begin to emerge about the first of August and continue until the early part of September. Within a few days these moths begin to lay eggs, which hatch in about ten days. A larger proportion of the eggs of the second brood are laid on the fruit than is the case with the first brood, and a larger proportion of the larvæ of the second brood enter the fruit at the side than did the first brood. These caterpillars remain in the fruit, on an average, between five and six weeks.

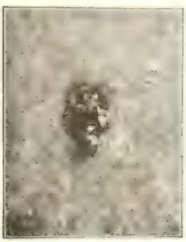


FIG. 98.— *Exit hole of codling moth larva, plugged with frass*

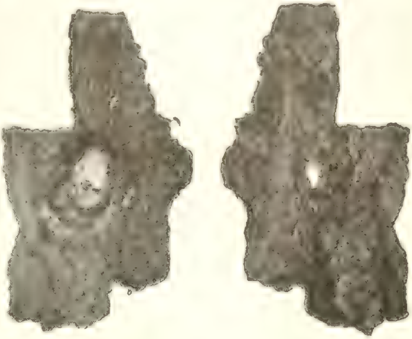
FIG. 99.— *Full-grown codling moth larva, enlarged about three times*

The second-brood moths begin to appear in New York during the latter part of July and the first of August, but the exact date of emergence differs somewhat with the condition of the weather and the locality. If May and June are cool and backward months, egg laying by the spring brood of moths will be retarded, and consequently a much smaller number of the caterpillars will complete their growth and leave the fruit before the first of August. Since the moths that lay the eggs for the summer brood of caterpillars must come from caterpillars that spin cocoons before August 1, under such circumstances this second, or summer, brood is greatly reduced in numbers. On the other hand, a warm May and June will accelerate the activities of the insects of the spring brood, so that a greater number of caterpillars will spin cocoons before August 1, thus producing a larger and more important summer brood.

The time of emergence of the second brood can easily be determined for any given locality by banding a few trees with burlap. A suitable band may be made from a strip from ten to fourteen inches wide, folded once lengthwise, and long enough to reach around the tree and have the ends lap. The ends of the band are held in place by a nail driven lightly into the tree where the ends meet. The bands should be in place by about the first of July in order to get the first caterpillars that leave the fruit. Some of the first-brood larvæ will take shelter under these bands and spin cocoons there. From about the middle of July on, these bands should be examined every few days; and when empty cocoons are found, it is an indication that the moths have begun to emerge, and that the young caterpillars of the second, or summer, brood will be entering the apples in about two weeks, depending, however, somewhat on the weather. This is the only sure method of determining when the second-brood moths are emerging, for the two broods overlap somewhat at times, and thus the first individuals of the second brood are often on the wing before the last of the first-brood moths have disappeared.

Natural enemies.— The eggs of the codling moth are often destroyed by a tiny wasplike parasite that deposits its eggs within the egg of the codling moth. The minute larvæ that hatch from these eggs devour the contents of the egg of the host, transform to pupæ within the eggshell, and finally emerge as adult parasites through a hole in the shell. Four of these parasites have been reared from a single egg. Other parasites attack the larvæ and pupæ of the codling moth, and it is subject in all stages to the ravages of predaceous insect enemies. In addition to the parasitic and predaceous insect enemies that attack the codling moth in its various stages, birds are efficient agents in holding the pest in check. Over a dozen species feed on it. The downy woodpecker, the nuthatch, and the chickadee destroy great numbers of the larvæ that winter under bark

flakes. Small flocks of these birds may be seen in the orchard during the fall and winter months carefully going over the trunk and branches of the trees searching for insect food. In Figure 100 *a* is shown an empty codling moth cocoon on the inner surface of a bark flake, and in *b* is shown the outer surface of the flake with a hole made by a woodpecker in extracting the larva. Many such flakes of bark may be found on apple trees infested by the codling moth. These birds are such efficient aids in destroying the codling moth that it will pay the orchardist not only to protect them but also in many cases to attract them to the trees by tying strips of beef fat or suet to a few branches. Birds will visit beef fat daily, and then spend hours in searching for insect food on the trees.



a b

FIG. 100.— *Bark flake showing hole through which codling moth larva has been extracted by woodpecker: a, inner surface; b, outer surface*

FIG. 101.— *Section through newly set apple showing calyx cavity, enlarged*

Means of control.—As has already been stated, seventy per cent or more of the first-brood larvæ enter the fruit at the blossom end. On this important habit of the codling moth rests the present system of controlling it with poison sprays. When the petals fall from the blossoms, the calyx lobes are spread apart enclosing a cavity, the bottom of which is formed by the bases of the stamens standing close together on the inner surface of the calyx cup, as shown in Figure 101. In the control of the codling moth an arsenical poison is sprayed into this calyx cup. In a week or so after the petals fall, the calyx lobes close over the cavity and prevent the poison from being washed out by the rain. On entering the apple the young caterpillar feeds for some time in the calyx cup, and is thus killed by the poison before the fruit is injured. The poison is applied just as the last of the petals are falling, because at

this time it can be sprayed into the calyx cup most easily. This is the most important spray for the codling moth and should be applied with great thoroughness. The material now almost always employed against the codling moth is arsenate of lead. It may be used either in the paste form or in the dry, or powdered, form. From four to six pounds of the paste or from two to three pounds of the powder should be mixed with one hundred gallons of water. It is necessary that the spray be applied with a pump giving a pressure of from one hundred to two hundred pounds per square inch, and the spray should be directed downward so as to hit the young fruits squarely in the blossom end. In order to do satisfactory work on the higher branches, the man handling the nozzle should stand on an elevated tower high enough so that with an extension rod twelve or fourteen feet long he can reach out over the top of the tree and by means of an angle nozzle direct the spray downward into the ends of the young apples. In the case of very tall trees it is impossible to thoroughly spray the tops; and under such circumstances it is better to head in the trees by judicious pruning. By doing very thorough work with this first spray it is possible to produce a crop of apples from ninety-five to ninety-eight per cent free from codling moth injury without making any later applications of the poison.

As has already been stated, the codling moths do not begin to emerge until about a week after the petals fall, and the eggs do not begin to hatch until about two weeks later, or three weeks after the petals fall. If an additional poison spray is applied at the time when the young caterpillars are hatching, many of them will be poisoned by feeding on the foliage before reaching the apples, since a large proportion of the eggs are laid on the leaves at some distance from the fruit. The spray will also coat the surface of the young fruits with poison, and thus kill many of the caterpillars that attempt to enter at the side. While this application is not absolutely necessary for the control of the codling moth, nevertheless a spray is usually applied about this time for the control of apple scab, and it will do enough good to more than pay for the arsenate of lead used, which is the only additional expense involved.

The best way to control the second brood of codling moths is to do such thorough and careful work in spraying for the first brood that practically no caterpillars will survive to give rise to moths of the second generation. In case, however, a person has been unsuccessful with the earlier applications of the poison, it is sometimes advisable to spray for the second brood about the first of August. As has been stated, the size and the importance of this second brood depend on the earliness of the first brood, and this in turn depends on the temperature during May and June. When the season has been early, there is more danger that the

crop will suffer from the attacks of second-brood larvæ, and under such circumstances, the late spray is more important than in years when growth has been more backward in the early part of the season. Here again, it is often desirable that poison be applied in combination with a fungicide in order to prevent late infections of apple scab.

Spraying schedule for the codling moth

A. *When the last of the petals are falling*
Arsenate of lead, 4 to 6 pounds in 100 gallons of lime-sulfur (32° Baumé) diluted 1 to 40. This is the most important spray for the control of codling moth and should never be omitted.

B. *About three weeks after the petals have fallen*
Arsenate of lead, 4 to 6 pounds in 100 gallons of lime-sulfur (32° Baumé) diluted 1 to 40.

C. *About August 1*
Arsenate of lead, 4 to 6 pounds in 100 gallons of lime-sulfur (32° Baumé) diluted 1 to 40.

THE APPLE MAGGOT

Rhagoletis pomonella Walsh

Summer and early fall apples in New York State are often badly infested by small whitish maggots (Fig. 102) about one-fourth inch in length, which tunnel through the fruit in all directions. Although summer and early fall varieties are most susceptible, winter apples are often seriously injured. Subacid and sweet varieties are most liable to infestation, but acid varieties, such as Baldwin, Rhode Island Greening, and Oldenburg, and even crab apples are sometimes attacked. Fameuse is very susceptible to injury by the apple maggot in the Lake Champlain district.

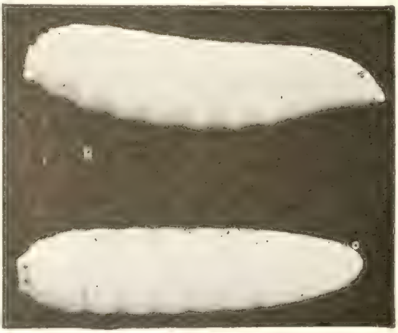


FIG. 102.—*Lateral and dorsal view of full-grown apple maggots. Enlarged*

Life history.—The parents of this maggot are two-winged blackish flies somewhat smaller than the house fly, with yellowish head and legs and three or four transverse whitish bands on the abdomen. The wings are marked with four confluent brownish bands (Fig. 103). In New York these flies first appear in the orchard in early July, usually from about the fourth to the middle of the month, and are common until the latter

part of September. The flies feed for from one to three weeks before egg laying begins. During this time they may be observed lapping drops of moisture from the fruit. The manner in which they take their food is interesting and also important from the standpoint of control. The mouthparts of these fruit flies are fitted for lapping or licking rather than for sucking or biting. The proboscis (Fig. 104) is a tonguelike organ roughened and somewhat enlarged on the end, by means of which fluid or semifluid substances may be lapped up.

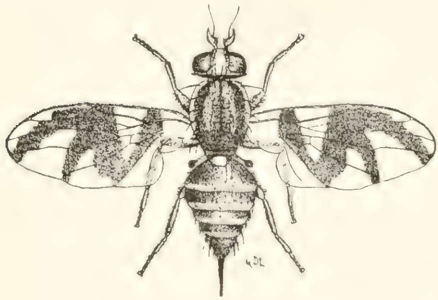


FIG. 103.— *Female apple maggot fly*

As has been stated, from one to three weeks of feeding must take place before the eggs are fully matured within the body of the female. At the end of this period egg laying begins. The female bears on the end of the abdomen a sharp ovipositor with which she inserts her minute, elongate, whitish eggs into the pulp of the fruit just beneath the skin (Fig. 105). Each female is probably capable of laying between three hundred and four hundred eggs. The eggs hatch in from two to six days. Immediately on hatching, the little maggots begin to tunnel just beneath the skin or into the fruit, but they grow slowly until the fruit begins to ripen or to decay (Fig. 106). Badly infested fruit often shows large brown areas on the skin, where decay has set in due to the presence of the maggots. Sometimes the maggots tunnel just beneath the skin, and in the light-colored varieties these burrows show through as winding darker areas. From this habit the insect has received, in many localities, the name of railroad worm. In many cases the apples are apparently sound at picking time, but later when they begin to soften in storage or in shipment, the maggots develop and render them unfit for use.

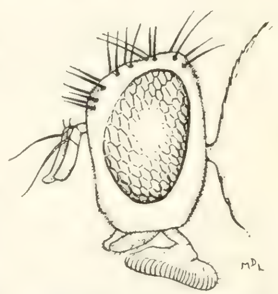


FIG. 104.— *Head of apple maggot fly showing lapping type of mouth parts*

FIG. 105.—*Egg of apple maggot inserted in the flesh of an apple just beneath the skin. Greatly enlarged*

The length of time that the maggots spend in the apples varies considerably with the condition of the fruit and of the

weather. If the fruit is ripening and if the weather is warm, the larvæ may become fully developed within two weeks after hatching from the eggs; while on the other hand if the fruit is hard and green and if the weather

FIG. 106.— *Apples infested by apple maggots, cut open in order to show decaying interior*

is cold, the maggots do not mature so quickly, and the time of emergence from the apples may be deferred for months. A case is on record where in January maggots were observed leaving the apples in storage. The presence of maggots in the fruit usually hastens decay and causes the apples to drop to the ground. When the larva becomes full-grown, it leaves the fruit by a small ragged exit-hole in the skin, burrows an inch or so into the ground, and its skin contracts and hardens to form a tough leathery protective covering known as a puparium (Fig. 107), which somewhat resembles a grain of wheat. Within this puparium a series of remarkable changes takes place, in which the organs of the larva are broken down and made over into those of the adult, or fly. By the end of the second day the true pupa is formed within this protective covering, and the head, legs, and wings of the fly become apparent. In this stage the insect spends the winter, and the following spring the fly emerges through a circular split at the head end of the puparium. In New York, however, during the

FIG. 107.— *Puparium of apple maggot, enlarged. Natural size shown in upper right-hand corner*

latter part of September a few of the puparia transform to flies and thus produce a partial second brood. This brood is small and probably does but little damage.

Means of control.— Injury by the apple maggot is most severe in neglected, unpruned, uncultivated, and unsprayed orchards. As a rule it is rarely troublesome in orchards that are properly cultivated and that have regularly received the usual sprays made for the codling moth. In orchards which for the past few years have been seriously infested it would be advisable to make three or four applications of sweetened arsenate of lead at intervals of a week, beginning when the flies first appear on the trees. The sweetened spray is prepared according to the following formula:

Arsenate of lead..........................	6 pounds
Cheap molasses..........................	2 gallons
Water..................................	100 gallons

The sweetened spray need not be applied with the care used in ordinary arsenical spraying, because it is in the nature of a bait to which the flies are attracted and on which they feed and die.

THE APPLE REDBUGS

Heterocordylus malinus Reuter and *Lygidea mendax* Reuter

FIG. 108.— *Adult apple redbug, enlarged*

Although apple redbugs had been under observation for some years at Ithaca, the first serious outbreak in New York State was in the spring of 1908 in a large orchard near Syracuse. Since that time they have been increasing in importance as an apple pest until they are now fairly common through the apple-growing regions of New York except in the northern part of the State.

There are two kinds of apple redbugs that are closely related and resemble each other in general appearance. For convenience in referring to them, one has been called the apple redbug and the other the false apple redbug. The adult apple redbug is about one-fourth inch in length (Fig. 108) and varies in color from red to black, and the

whole upper surface of the body is thinly covered with conspicuous white, flattened, scalelike hairs. The adult of the false redbug (Fig. 109) is of almost the same size as the preceding, but the color is generally a lighter red, and there are no white hairs on the upper surface of the body.

FIG. 109.— *Adult false apple redbug, enlarged*

Life history.—The life histories of these two redbugs are similar. The insects spend the winter in the egg stage. The eggs are dull whitish, sharply curved, and slightly compressed. These are inserted by the females, during late June or early July, their full length into the bark of the smaller branches, preferably of the previous season's growth. As far as is known, the eggs of the redbug are placed in a slit in the bark at the base of the fruit spurs and around the buds, while those of the false redbug are usually inserted in the lenticels of the smooth two-year-old wood (Fig. 110). The eggs of the redbug hatch after the fruit buds burst, and hatching is about over by the time the blossoms open. Those of the false redbug hatch about a week later, or while the trees are in blossom.

FIG. 110.— *Section of twig showing egg of false apple redbug*

The young nymphs of the two species are very similar in appearance. Those of the false redbug (Fig. 111) may be distinguished by their brighter red color, the absence of darker markings on the thorax, and by the body's being covered with fine short black hairs. This species retains its bright color until full-grown, but the redbug (Fig. 112) becomes nearly black on the thorax after the third molt.

The redbugs pass through five immature, or nymphal, stages, the wing pads becoming more apparent each time the skin is shed until

with the fifth molt the wings are fully developed. The insects reach maturity in about a month after hatching.

FIG. 111.— *Fifth stage nymph of false apple redbug*

Shortly after hatching the young nymphs make their way to the leaves from which they suck the juices by means of the slender bristles within their beaks. The leaves become spotted with minute reddish dots due to the small feeding-punctures of the nymphs. This condition is often the first indication of the presence of red-bugs, since the insects themselves are very shy and extremely difficult to locate among the opening buds in an orchard. The nymphs may live on the foliage until full-grown, but usually they attack the fruit as soon as it sets (Fig. 113). The injury to the foliage though often conspicuous is of little importance, and it is to the fruit that the greatest damage is done. When the fruit is very young the bristles of the young bug's beak may penetrate to the center. The tissue about this puncture becomes discolored (Fig. 114) and hardens so that a corky thread extends to the core. Many of the injured apples fall to the ground, others dry up on the trees, while the remaining ones mature but are knotty and unmarketable.

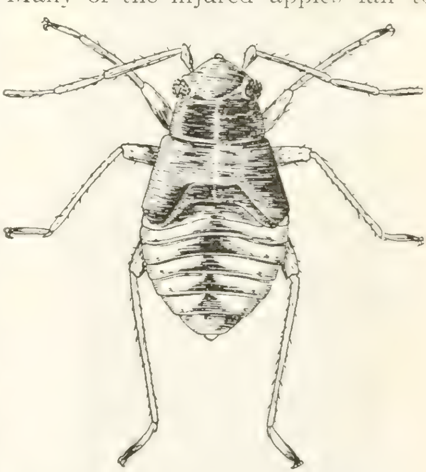


FIG. 112.— *Fifth stage nymph of apple redbug*

Apparently Rhode Island Greening, Pumpkin Sweet (Pound Sweet), Ben Davis, and Northern Spy, in the order named, are the most susceptible to injury, but other varieties are also somewhat liable to attack. Occasionally the entire crop may be rendered worthless for market, but ordinarily the extent of the injury is much less. It sometimes happens that about twenty-five per cent of the crop is rendered unmarketable. Knotty apples are also caused by curculio punctures and by aphis injury. Red-bug injury may be distinguished from that of the plum curculio by

the fact that no tissue is removed, the juice merely being sucked out, causing a smooth depression in the fruit (Fig. 115). The feeding and egg-laying punctures of the curculio cause characteristic scars, as shown in Figure 116. Aphis injury is characterized by a puckering about the blow end of the fruit, which does not appear in typical redbug injury.

FIG. 113.— *Nymph of apple redbug feeding on a young apple*

Means of control. — If only the true redbug of the apple is present in the orchard, it can be effectually controlled by a thorough application of "black leaf 40" tobacco extract. It should be mixed in the proportion of 1 pint to 100 gallons of water, and 4 or 5 pounds of soap should be added to the mixture in order to make it stick and spread better. This spray should be applied about the time the blossoms show pink, in order to kill the nymphs while they are still young. If, however, as is usually the case, the false redbug is also present, the application should be repeated just after the blossoms fall in order to kill the young of this species.

FIG. 114.— *Small apples cut open to show discolored areas around the punctures made by redbugs*

The two applications coincide with the first scab spray and the calyx

spray for the codling moth. "Black leaf 40" can be satisfactorily combined with the dilute lime-sulphur and arsenate of lead used at these times. In this case the soap cannot be added. These applications should be sufficient to control an ordinary infestation of redbugs. In case, however, the insects are present in great numbers, it is necessary to use such large quantities of the spray liquid that there is danger of foliage injury from the lime-sulfur. Under such circumstances the "black leaf 40" spray should be applied separately. It is necessary to spray for redbugs at the times indicated, because a little later, when the redbugs have become larger, they are very resistant to the sprays, and it is then much more difficult to kill them. If the spraying is done too early some of the eggs will not have hatched.

FIG. 115.—*Mature apple, showing injury by redbugs*

In order to spray successfully for redbugs very thorough work must be done. The insects have mouth parts of the sucking type, and it is therefore necessary to hit every insect with the spray so as to wet it thoroughly. Moreover, the young nymphs are extremely agile and readily dodge to the other side of a branch or take refuge among partly expanded clusters of leaves. In order to be most effective the spraying should be done on a warm day when the young bugs are most active, for in cool weather they often secrete themselves in the curls of the unopened leaves where it is impossible to reach them with a spray. A fairly coarse nozzle with a moderate pressure, from 100 to 120 pounds, will be found the most satisfactory. When the nicotine solution is combined with lime-sulfur and arsenate of lead, a finer nozzle should be used.

FIG. 116.—*Apple scarred by egg-laying punctures of the plum curculio*

It is often desirable to determine in advance of the spraying season whether or not an orchard is infested. This may be easily done by bringing small branches indoors any time after the first of March and by placing them in dishes of water to force out the buds. If eggs are present on these branches, the young redbugs will appear at the proper time and

will begin feeding on the leaves and the blossoms, and in this way a person is easily able to determine which species is present.

THE FRUIT-TREE LEAF-ROLLER

Archips argyrospila Walker

For some years past, in Colorado and Missouri orchards this leaf roller has been one of the most serious insect pests with which apple growers have had to contend. It has been found in New York State since 1874, and in 1888 and 1892 it was recorded as injuring apples and pears to a slight extent, but it was not until 1911 that it suddenly became a serious apple pest. During the spring of that year the insects appeared in very large numbers in an orchard in Genesee County and in varying numbers in many other orchards in the State. Since then it has been increasing in importance as an apple pest, until during the past season it caused more or less injury in most orchards throughout the apple-growing sections and was very injurious in certain widely separated orchards in western New York.

FIG. 117.— *Egg mass of fruit-tree leaf-roller, showing holes through which the young caterpillars emerged. Enlarged*

The fruit-tree leaf-roller, though an apple pest, by no means confines its attacks to this fruit. It is also very destructive to pears and has been found feeding in this State on sweet cherry, wild cherry, plum, quince, black walnut, and mountain ash. In the West it has been observed on rose, currant, gooseberry, apricot, Osage orange, box elder, sassafras, and hazel, in addition to its more common orchard food plants. It has also been collected from a number of different kinds of shade and forest trees.

Although this insect is not equally injurious from year to year in any given locality, on account of its wide range of food plants it is easily able to maintain itself in a section until such time as conditions are favorable to its rapid increase. It may then suddenly become one of the most serious pests with which the apple grower has to deal.

Life history.— This insect spends the winter in the egg stage. The eggs are laid on the smaller twigs and fruit spurs in small oval, flat, grayish patches, about one-fourth inch in diameter (Fig. 117). The average number of eggs in one of these masses is about one hundred and fifty though this often varies considerably. Each egg mass is protected by a smooth varnish-like substance. In New York State the eggs hatch just as the buds are bursting, and by the time the blossoms show pink

hatching is practically complete. The young caterpillars are about one-twenty-fifth inch in length and of a light green color with a black head and a black thoracic plate just behind the head. They bore into the opening buds and feed on the expanding leaves, which they web together to form a loose nest. As soon as the blossoms fall, the partly grown caterpillars attack the fruit, first devouring the calyx lobes and then eating large irregular holes in the young apples. It is to the fruit that the chief injury is done, though frequently many buds and much of the foliage are destroyed, and in a number of cases large orchards have been completely defoliated by this insect. The most severely injured apples soon drop from the tree; those which are not so badly eaten mature but are knotty. The wounds made by the caterpillars heal over, leaving large, brownish, corky scars, which render the apples misshapen and unmarketable (Fig. 118). The scars caused by the leaf roller are, as a rule, deeper than those made by the green fruit-worm.

FIG. 118.— *Mature apple, showing scar of wound made by fruit-tree leaf-roller when the fruit was small*

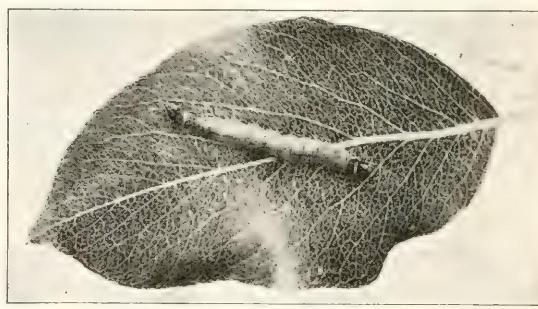


FIG. 119.— *Full-grown leaf-roller caterpillar*

The caterpillars become full-grown in about three weeks, at which time they measure about one inch in length and are of a light green color with head, legs, and thoracic shield varying from brown to black (Fig. 119.) They then transform to brown pupæ (Fig. 120) within a rolled leaf (Fig. 121) and in about ten days, or early in June, the moths emerge. These insects have a wing expanse of from three-fourths of an inch to one inch. The front wings are mottled with various shades of rich brown and yellowish white. Some are much darker than others, and the distinctness of the markings varies considerably (Fig. 122).

FIG. 120.— *Pupæ of fruit-tree leaf-roller*

The female moth lays her eggs in flat masses usually on the twigs and smaller branches. In New York most of the eggs are laid by the last of June, but they do not hatch until the following spring. There is only one brood annually, about ten months being spent in the egg stage.

FIG. 121.— *Leaf rolled by fruit-tree leaf-roller*

Means of control.— The fruit-tree leaf-roller has been found to be a difficult insect to control. It often happens that its most destructive outbreaks occur in well-sprayed, well-cared-for orchards. This is because the eggs are not injured by the lime-sulfur spray usually applied, and because the caterpillars feed in the open only for a short time after the buds have burst, at which time no arsenical is ordinarily applied to the trees. Thus this insect is able to escape the applications usually given in a spraying schedule.

The method employed in controlling the leaf roller will depend entirely on the amount of infestation. This can be estimated by the amount of injury done to the crop of the preceding year or less readily by an examination of the trees for egg masses. In cases where only a moderate infestation is indicated, a reasonable degree of control can be obtained by thorough spraying with arsenate of lead, $2\frac{1}{2}$ to 3 pounds in 100 gallons of water. This should be applied as soon as the leaves of the cluster buds begin to open.

FIG. 122.— *Moth of fruit-tree leaf-roller*

In cases of severe infestation, experience has shown that the pest cannot be controlled by the use of arsenical sprays alone. In such cases

the trees should be sprayed just before the buds open with a miscible oil, 1 gallon in 15 gallons of water. Great care should be taken to do thorough work and to apply the liquid so as to wet each egg mass. In this way from seventy to ninety per cent of the eggs can be destroyed, but this treatment alone cannot be relied on to control the pest. It must be supplemented by one or two thorough applications of arsenate of lead, 2½ to 3 pounds in 100 gallons of water, made just after the buds have opened. That is, the trees should be sprayed as soon as the buds burst and then resprayed immediately.

GREEN FRUIT-WORMS

Xylina antennata Walker, and other species

Although green fruit-worms are generally distributed throughout the State they do not often become of importance as apple pests. They are primarily forest insects feeding on the foliage of poplar, soft maple, hickory, and wild cherry. Serious outbreaks have occurred at long intervals, 1877, 1896, and again in 1913. For the past two years they have been especially troublesome in the orchards of Clinton County. The scarcity of these insects over long periods of time has been attributed to adverse climatic conditions and to the depredations of parasitic enemies. In years of abundance these caterpillars are capable of causing great losses to the apple crop, and growers should be familiar with the nature of the injury and should understand the best means of preventing such loss.

FIG. 123.—*Eggs of green fruit-worm on twig, enlarged*

Although there are three closely related species of green fruit-worms commonly destructive to apples, they are all very similar in appearance and habits. The parent moths appear in the orchard in March or April and deposit their small, nearly globular, ridged, yellowish eggs (Fig. 123) singly on the smaller branches or sometimes on the underside of the leaves. The moth has an expanse of about one and one-half inches. The fore wings are brownish gray with obscure darker markings; the hind wings are lighter in color (Fig. 124). The moths are sometimes a nuisance in sugar maple groves, where they are attracted to the sap and collect in great numbers in the sap pails.

FIG. 124.— *Moth of green fruit-worm*

The eggs hatch as the buds are bursting, and the young caterpillars at first feed on the opening leaves. By the time the fruit sets most of

the caterpillars are half grown, and they soon turn their attention to the young apples. They begin feeding on the side of the apple and eat out large rather shallow cavities, often continuing their work until nearly half the fruit is devoured (Fig. 125). If the portion injured is not too large, the wound heals over, leaving a large, corky scar, and the apple matures. The scars made by the green fruit-worm are similar to those caused by the fruit-tree leaf-roller but, as a rule, are not so deep, although in many cases it is impossible to determine from the mature fruit which insect was responsible for the injury.

FIG. 125.—*Green fruit-worms feeding on young apples*

Green fruit-worms work on the fruit chiefly during May though some continue feeding until nearly the middle of June. When full-grown they range from an inch to an inch and a half in length and are light yellowish or apple green in color. A narrow cream-colored stripe extends down the middle of the back and a wide cream-colored stripe along each side with many similarly colored mottlings or spots, which sometimes form quite distinct stripes along the body above the broad lateral stripes.

FIG. 126.—*Pupa of green fruit-worm, enlarged*

By the first week in June most of the caterpillars have attained their full growth. They then burrow into the soil beneath the trees to a depth of from one to three inches where they roll and twist their bodies about until a smooth earthen cell is formed. Most of them then spin about themselves a thin silken cocoon; others spin no cocoon.

Soon after entering the ground the caterpillars transform within the cocoon or earthen cell to dark brown pupæ (Fig. 126). At the end of three months, or about the middle of September, most of the moths emerge and go into hibernation. Some of the pupæ, however, remain in the ground and do not transform into moths until the following spring.

Means of control.— When the caterpillars begin feeding on the fruit most of them are about half grown. At this time they are very resistant to poison sprays and it is then too late to do effective work against them. The newly hatched caterpillars are more easily poisoned. Their numbers may be greatly reduced by making one or two applications of arsenate of lead, 5 or 6 pounds in 100 gallons of water, before the blossoms open. In this case one of these sprays will coincide with the first scab spray when the blossoms show pink, and the arsenate of lead should be used in combination with the dilute lime-sulfur. In cases of severe infestation it is important that a poison spray be applied just before the blossom clusters separate.

ADVANCED READING-COURSES

Two advanced reading-courses are now offered by the Cornell Reading-Course for the Farm: the advanced reading-course in fruit growing and the advanced reading-course in vegetable gardening. These courses aim to assist persons who desire to make a careful and systematic study of these subjects. They are especially provided for members of the reading-course for the farm who have completed a study of the available reading-course lessons and who are now ready to specialize. A textbook, questions, and correspondence are used in conducting each course. Statements on important questions are prepared by the students, and are graded by an instructor and returned with helpful comments and suggestions. This provides an opportunity to have opinions and conclusions that are the result of study or experience, judged and corrected by an expert. The requirement of effort and thought on the part of the student by means of questions, and the returning of corrected papers with the grades, offer to the student some of the advantages of a correspondence course. The only expense connected with the courses is the purchase of the textbook. As this remains in the possession of the student, it may well be looked on as a permanent investment. The cost for the textbook in the advanced reading-course in fruit growing is $1.35, and in the advanced reading-course in vegetable gardening is $1.65.

The following is an outline of the nature and the requirements of the work given in the advanced reading-courses. The chapters in the textbook are studied consecutively, one at a time. The student's purpose should be to study, and not merely to read. Each chapter should receive considerable time and thought. The best results will be obtained by setting aside a definite time each day for the work. After making a careful study of each chapter, clear and concise answers should be made to the questions on it without referring to the text. In general it is expected that the course will be completed within six months. The student should

do the work regularly, covering at least one chapter every week, for by so doing interest in the course will not drag, and better results will be obtained.

Any resident of New York State who desires to enroll in either of the advanced reading-courses should write for further information to the Supervisor of the Reading-Course for the Farm, College of Agriculture, Ithaca, New York.

AVAILABLE READING-COURSE LESSONS FOR THE FARM, ARRANGED BY SERIES

Residents of New York State may register for one or more of the series mentioned below by addressing The Cornell Reading-Course for the Farm, College of Agriculture, Ithaca, New York.

SERIES		LESSONS
The soil	74	Introduction to the principles of soil fertility
	42	Tilth and tillage of the soil
	50	Nature, effects, and maintenance of humus in the soil
	70	Soil moisture and crop production
	78	Land drainage and soil efficiency
Poultry	80	Incubation
	10	Feeding young chickens
Rural engineering	8	Knots, hitches, and splices
	*56	Sewage disposal for country homes
Farm forestry	12	The improvement of the woodlot
	28	Recent New York State Laws giving relief from taxation on lands used for forestry purposes
	40	County, town, and village forests
	62	Methods of determining the value of timber in the farm woodlot
The horse	46	Feeding and care of the horse
	56	Practical horse-breeding
Dairying	16	Practical dairy problems
	32	Composition of milk and some of its products
	54	The dairy herd
	60	Farm butter-making
	82	Cream separation
	86	The production of clean milk (in press)

*Lesson for the Farm Home.

SERIES		LESSONS
Fruit growing	22	The culture of the currant and the gooseberry
	36	Culture of red and black raspberries and of purple-cane varieties
	48	Culture of the cherry
	52	Culture of the blackberry
	72	Culture of the grape
Farm crops	20	Alfalfa for New York
	24	The rotation of farm crops
	66	Meadows in New York
Stock feeding	26	Computing rations for farm animals
Vegetable gardening	34	Home-garden planning
	58	Planting the home vegetable garden
Plant breeding	38	Principles and methods of plant-breeding
	44	Methods of breeding oats
	68	Improving the potato crop by selection
Country life	64	The rural school and the community
	76	Birds in their relation to agriculture in New York State
Insect	84	Insects injurious to the fruit of the apple

The above list is correct to April 15, 1915. The demand may at any time exhaust the supply of particular numbers. Requests will be filled as long as the supply lasts.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 84 MARCH 15, 1915 INSECT SERIES No. 1

INSECTS INJURIOUS TO THE FRUIT OF THE APPLE

DISCUSSION PAPER

A discussion paper is sent with each reading-course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully, and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading-course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, the reader should sign and return this discussion paper, whether the questions are answered or not.* By means of reading-course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading-course work, and also for names and addresses of any residents of New York State likely to become interested in the Cornell Reading-Course for the Farm.*

(In answering questions, attach additional paper if needed and number the answers.)

1. Describe the injury caused by codling moth, apple maggot, apple redbugs, fruit-tree leaf-roller, and green fruit-worms.

2. Outline briefly the life history of the codling moth.

3. When would you spray for the codling moth? Give reasons.

4. If at any time you have been unsuccessful in controlling the codling moth, to what do you attribute your failure?

5. What varieties of apples have you observed infested by the apple maggot, and which of these were most severely injured?

6. What has been your experience in attempting to control the apple maggot?

7. Have you ever observed in your locality any apples injured by red-bugs? What varieties are most subject to attack in your region?

8. How can the injury to the fruit by redbugs be distinguished from that caused by the plum curculio or the apple aphis?

9. Have you ever used a miscible oil as a dormant spray on the apple to control the leaf roller? If so, with what results?

10. How would you spray an apple orchard badly infested with codling moth, redbugs, and green fruit-worm?

Name...

Address..

Date...

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 86 | APRIL 15, 1915 | DAIRYING SERIES No. 6

THE PRODUCTION OF CLEAN MILK

T. J. McINERNEY

The milk ordinance which went into effect in New York on January 1, 1915, is of importance to all milk producers within the State, unless their

FIG. 127.—*An inexpensive barn but one in which clean milk is produced by means of careful attention to methods*

milk has been graded by some local regulation or ordinance established prior to September 1, 1914.

The chief provisions of this ordinance may be briefly stated as follows: The milk is to be graded, with the exception of certified milk, according to the health of the cows, the sanitary conditions existing in the dairy barn and the milk house as determined by the dairy score, the bacteria content of the milk or the cream, and the fact that the milk or the cream

has or has not been pasteurized. With the exception of certified milk, the different grades of milk are defined in the code as follows:

"Grade A Raw"
"Grade A Pasteurized"
"Grade B Raw"
"Grade B Pasteurized"
"Grade C Raw"
"Grade C Pasteurized"

Since the Government score card endorsed by the Official Dairy Instructors' Association is to be used in scoring the dairies, it may be

FIG. 128.—*Interior of barn shown in figure 127*

well to give a brief explanation of it here. This score card (pages 1925 and 1926) attempts to enumerate the points that a good dairy should possess, and gives these points a numerical value. This card may be cut out and used in scoring the reader's dairy. Probably the dairy score card is most valuable in an educational way. It is educational to the farmer or dairyman because it points out certain defects and shows wherein he can improve; it is educational to the consumer because he can see which dairies are best from a sanitary standpoint. The score card is divided into two parts, equipment and methods. The equipment is

SCORE CARD USED IN ENFORCING THE MILK ORDINANCE

Indorsed by the Official Dairy Instructors' Association

Owner or lessee of farm..

P. O. Address.. State..........

Total number of cows.................................. Number milking..................................

Gallons of milk produced daily..

Product is sold by producer to families, hotels, restaurants, stores,

or to..dealer

For milk supply of..

Permit No........................ Date of inspection.................................191....

REMARKS..

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(*Signed*)..

Inspector

SCORE

Equipment	Score: Perfect	Score: Allowed
COWS		
Health	6	
Apparently in good health 1		
If tested with tuberculin within a year and no tuberculosis is found, or if tested within six months and all reacting animals removed .. 5		
(If tested within a year and reacting animals are found and removed, 3)		
Food, clean and wholesome	1	
Water, clean and fresh	1	
STABLES		
Location of stable	2	
Well drained 1		
Free from contaminating surroundings 1		
Construction of stable	4	
Tight, sound floor and proper gutter 2		
Smooth, tight walls and ceiling 1		
Proper stall, tie, and manger .. 1		
Provision for light: Four sq. ft. of glass per cow	4	
(Three sq. ft., 3; 2 sq. ft., 2; 1 sq. ft., 1. Deduct for uneven distribution.)		
Bedding	1	
Ventilation	7	
Provision for fresh air, controllable flue system 3		
(Windows hinged at bottom, 1.50; sliding windows, 1; other openings, .50)		
Cubic feet of space per cow, 500 feet 3		
(Less than 500 ft., 2; less than 400 ft., 1; less than 300 ft., 0)		
Provision for controlling temperature 1		
UTENSILS		
Construction and condition of utensils	1	
Water for cleaning	1	
(Clean, convenient, and abundant)		
Small top milk pail	5	
Milk cooler	1	
Clean milking suits	1	
MILK ROOM OR MILK HOUSE		
Location free from contaminating surroundings	1	
Construction of milk room	2	
Floor, walls, and ceiling 1		
Light, ventilation, screens 1		
Separate rooms for washing utensils and handling milk	1	
Facilities for steam (Hot water, 0.5)	1	
Total	40	

Methods	Score: Perfect	Score: Allowed
COWS		
Clean	8	
(Free from visible dirt, 6)		
STABLE		
Cleanliness of stable	6	
Floor 2		
Walls 1		
Ceiling and ledges 1		
Mangers and partitions 1		
Windows 1		
Stable air at milking time	5	
Freedom from dust 3		
Freedom from odors 2		
Cleanliness of bedding	1	
Barnyard	2	
Clean 1		
Well drained 1		
Removal of manure daily	2	
To 50 feet or more from stable		
MILK ROOM OR MILK HOUSE		
Cleanliness of milk room	3	
UTENSILS AND MILKING		
Care and cleanliness of utensils	8	
Thoroughly washed 2		
Sterilized in steam for 15 minutes 3		
(Placed over steam jet or scalded with boiling water, 2.)		
Protected from contamination 3		
Cleanliness of milking	9	
Clean, dry hands 3		
Udders washed and wiped ... 6		
(Udders cleaned with moist cloth, 4; cleaned with dry cloth or brush at least 15 minutes before milking, 1)		
HANDLING THE MILK		
Cleanliness of attendants in milk room	2	
Milk removed immediately from stable without pouring from pail	2	
Cooled immediately after milking each cow	2	
Cooled below 50° F	5	
(51° to 55°, 4; 56° to 60°, 2)		
Stored below 50° F	3	
(51° to 55°, 2; 56° to 60°, 1)		
Transportation below 50° F	2	
(51° to 55°, 1.50; 56° to 60°, 1)		
(If delivered twice a day allow perfect score for storage and transportation.)		
Total	60	

Equipment .... + Methods .... = ... Final Score

NOTE 1 — If any exceptionally filthy condition is found, particularly dirty utensils, the total score may be further limited.

NOTE 2 — If the water is exposed to dangerous contamination, or if there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.

given a value of 40 per cent and the methods 60 per cent. The reason for this difference is that a man may have a poor dairy barn, that is, a poor equipment as to buildings and the like, but if he is neat and clean in his methods, he can produce a good grade of milk and receive credit for his clean methods on the score card. In figures 127 and 128 are shown the exterior and the interior of an inexpensive barn. By careful attention to methods, milk was produced in this barn that had an average for one year of 5133 bacteria per cubic centimeter in morning's milk and 5000 bacteria per cubic centimeter in night's milk.

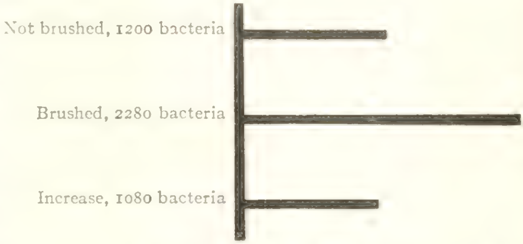


FIG. 129.— *A diagram showing the increase in the bacteria content of milk caused by brushing the cows immediately before milking*

Because a man may have an excellent or a very expensive dairy farm, it does not follow that a good grade of milk is produced. If the methods are unclean, the milk will be of an inferior quality, and the score will be reduced under methods.

THE COW

First of all in the production of clean milk, it is necessary to have healthy cows. If the cows are diseased, their milk may contain disease-producing bacteria or be otherwise unfit for use. Special attention should be given to the condition of the udder, and any milk that appears slimy, ropy, watery, colored, or otherwise abnormal should be discarded. A skilled veterinarian may do much to determine the general health of a cow by giving her a thorough physical examination. Clean and wholesome food, as well as plenty of clean fresh water, are essential. If the watering trough and surroundings are kept clean, there is less chance of the water supply's being contaminated.

The surface of the cow's body is one of the most important sources of milk contamination. It is therefore essential that extra care be given to keep the cow clean. Cows kept on pasture usually keep cleaner than those kept in the barn, but in either case thorough grooming is necessary to remove loose hairs, dust, microorganisms, and the like, so that they will not fall into the milk pail. The process of grooming, feeding, or bedding the cows tends to fill the air with dust and bacteria; therefore these operations should be done long enough before milking to give the dust plenty of time to settle. The increase in the bacteria count in milk drawn shortly after grooming and feeding is shown in figures 129 and

130. The data used in the construction of these diagrams were taken from experiments conducted at the Connecticut (Storrs) Agricultural Experiment Station.[1]

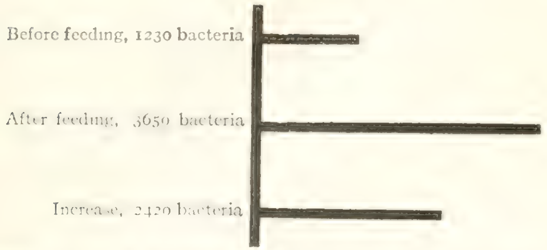


FIG. 130.—*A diagram showing the increase in the bacteria content of milk caused by feeding the cows dry corn stover immediately before milking*

A damp cloth used on the cow's udder and flanks just before milking will remove most of the dust and loose hairs that might otherwise fall into the milk pail. This will reduce the bacteria count, as is shown in figure 131.

THE STABLE

High ground sloping toward the south or the east is an ideal site for a barnyard in this State, for a slope in either of these directions protects the animals from the prevailing winter winds. Pigpens, outhouses, piles of manure, and the like, left standing in the barnyard, may be sources of contamination.

The construction of the stable may be of less importance than careful methods in the production of clean milk, but it should be such as to lighten the labor necessary for keeping the stable and its equipment clean. The most common defect in dairy stables is a lack of cleanliness. The interior of the barn should be so constructed that dirt, cobwebs, and the like, cannot easily collect. The stable floor and the gutter should be made of some material, such as cement, that will not absorb moisture, but that is easy to clean and disinfect in case of necessity. A swing stanchion is more comfortable for a cow than a rigid one, and should be so constructed that it does not collect dirt. The length of the stalls should be such that the cows can stand comfortably and the droppings fall into the gutter. A sufficient amount of clean bedding should be used to insure the comfort and the cleanliness of the cows.

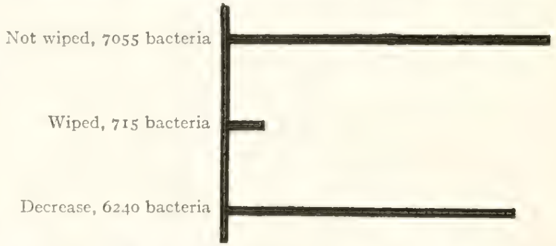


FIG. 131.—*A diagram showing the decrease in the bacteria content of milk caused by wiping the cows' udders with a damp cloth immediately before milking*

[1] Quality of milk affected by common dairy practices. By W. A. Stocking, jr. Connecticut (Storrs) Agricultural Experiment Station. Bulletin 42.

Another requirement of a sanitary cow stable is good light, which is necessary in order that the work may be properly done and that the general health of the animals may be good. A good coat of whitewash applied to the interior of the stable at least twice a year is a very inexpensive and efficient method of keeping it light and clean; a bright, clean stable is a great incentive to the production of clean milk. Sunlight is one of our greatest natural disinfectants, and the stable should have plenty of window space so that the sunlight can enter. If light is lacking on the underground side of a basement stable, a window may be cut in the floor above according to the diagram shown in figure 132.

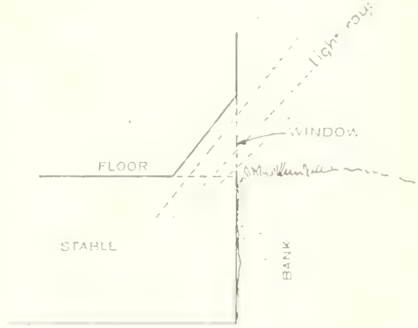


FIG. 132.— *A diagram showing a method of lighting a basement stable*

Good ventilation, as well as plenty of sunlight, is necessary for the health of the animals. Every dairy stable should have some system of ventilation to keep the air fresh and pure and the cows comfortable and unexposed to injurious drafts. Poor ventilation usually means poor sanitary conditions. One good method of ventilation is the King system, but this will not work unless the building is tight. Simple direct openings

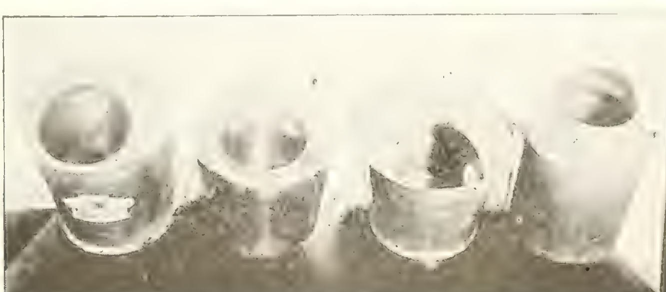


FIG. 133.— *Types of sanitary milk pails*

are very effective, but they are likely to make a direct draft, especially if they are exactly opposite each other. The cloth curtain system has two advantages in that it is inexpensive and the curtains can be easily replaced when they become dirty, but the main disadvantages are that this system may collect dust and may not be suitable for cold climates.

THE CONSTRUCTION AND THE CARE OF DAIRY UTENSILS

Probably no one thing will have a more beneficial effect on the production of clean milk than the use of a small top, or a covered, milk pail (Fig. 134). There seems to be a prejudice on the part of many dairymen against this type of pail, based on the ground that it is difficult to use. Perhaps a part of this prejudice is due to the fact that some impractical pails have been put on the market. There are, however, many good types of sanitary pails (Fig. 133), and careful inquiry has shown that not a single dairyman who has given this type of pail a fair trial would go back to using the old wide mouth type. A pail that is about two-thirds or three-fourths covered is the type that is in general use.

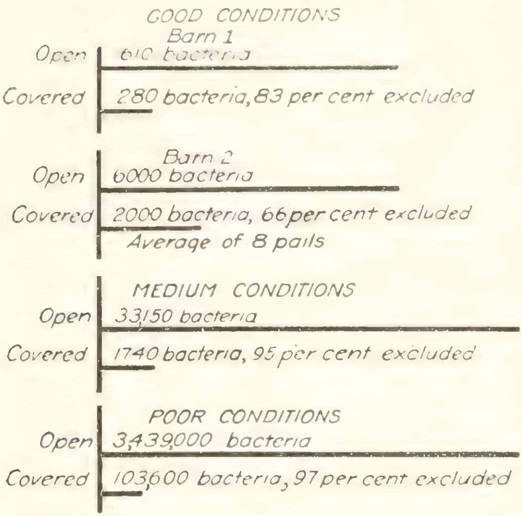


FIG. 134.—*A diagram showing the effect of a small top, or covered, milk pail in eliminating bacteria from milk. The relative number of bacteria in each case is shown by the length of the lines, but a different scale is required in each of the four cases because of the great variation in the number of bacteria, as shown by the figures*

All dairy utensils should be so constructed that they can be easily cleaned. This means that all crevices and seams of the utensils must be well flushed with solder (Fig. 135). If the seams and crevices are left open, as in diagram A, milk will accumulate in these places; it is practically impossible to thoroughly wash and sterilize such utensils. This deposit of partly decomposed milk forms an excellent breeding place for bacteria, which contaminate each fresh lot of milk put into the

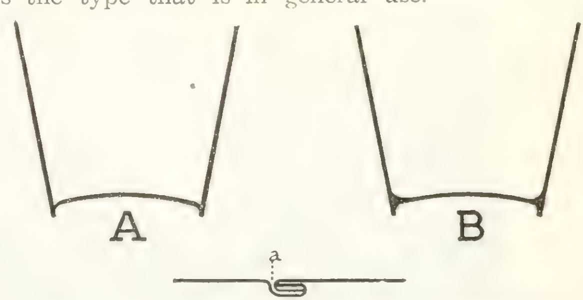


FIG. 135.—*A diagram showing the wrong and the right kinds of a milk pail.* A *shows the ordinary type, which has a sharp angle between the sides and the bottom;* B *shows the same pail properly flushed with solder, so as to facilitate thorough cleaning. The lower figure represents a joint as ordinarily made in tinware. The depression* (a) *affords a place of refuge for bacteria, from which they are not readily dislodged. This joint should be filled completely with solder*

utensil. This contamination may be so great as to very seriously affect the keeping quality of the milk.

The proper procedure in cleaning any dairy utensil is as follows: First, rinse the utensil in lukewarm water; second, wash it thoroughly with a brush in a strong solution of hot water and washing powder, about a handful to a 12- or 14-quart pail of water; third, scald it with boiling water or place it in a steam sterilizer. The reason for each step in the procedure is as follows: Lukewarm water is used for rinsing the utensil because milk contains about .7 of 1 per cent of albumen, which is coagulated and precipitated on the utensil so that it is very hard to remove if water of a temperature of 160° F. or above is used. The utensil should be washed in a strong solution of alkali powder and hot water because normal milk contains about 4 per cent of milk-fat, and this solution will dissolve any fat that is on the utensil. A brush is best to use for this work because it enters the seams and crevices better and can be kept clean much more easily than a cloth, which may be a breeding place for bacteria unless great care is given to cleaning it each time after using. The utensil must be sterilized in order to be perfectly clean. If water is used for this purpose, it must have a temperature of 180° F. or higher in order to kill all bacteria that may be present. The utensil should be left in this water for at least several minutes in order to become sterile.

The value of thorough sterilizing of utensils is shown by the following results of bacteriological tests of milk samples taken from dairies where the utensils were properly scalded and where they were not scalded. All these samples were taken on the same days, as the producers delivered the milk to the dealer. A's utensils were properly washed and scalded twice a day, but B's were not scalded.

Date of taking sample	Bacteria per cubic centimeter in A's milk	Bacteria per cubic centimeter in B's milk
1913		
November 1	2,000	98,000
1914		
January 20	2,500	141,000
January 30	6,000	4,697,000
March 14	19,000	54,000
March 28	50,000	5,400,000
April 11	2,500	600,000
April 20	3,000	680,000
May 18	3,500	172,500
May 25	7,000	965,000
June 1	6,000	6,750,000
June 9	23,000	1,600,000
June 18	9,500	1,200,000
June 26	9,000	600,000
Average	11,000	1,765,961

The figures in the preceding table show the very important part the sterilization of utensils plays in the production of clean milk.

On the official dairy score card, the two dairies showed the following score:

	Equipment	+	Methods	=	Final Score
A =	29.3	+	48.1	=	77.4
B =	28.0	+	37.2	=	65.2

The equipment in B's case was about the same as in A's, but the methods in A's case were nearly 11 per cent better; methods and not equipment count most in the production of clean milk.

THE MILK ROOM OR THE MILK HOUSE

The location and the construction of the room or the house in which the milk is handled and the utensils washed is also a very important factor in clean milk production. The milk house should be so located that it will have good drainage and be free from any contamination. The principal purpose in building a milk house is to provide a place where the milk and the utensils may be handled apart from all other dairy operations.

FIG. 136.— *A galvanized iron sterilizer. This is inexpensive and saves labor*

The milk room or milk house should be so constructed and cared for that it will be thoroughly clean. Smooth, tight walls and ceilings are desirable for the same reason here as in the dairy barn, that is, they prevent the collection of dirt. Milk house floors made of cement are more sanitary and durable than wood floors, because they do not readily absorb moisture, are more easily cleaned, and are not injured by water used in cleaning the utensils and the floor itself. The milk house should be well supplied with fresh air and sunlight, and special care should be taken to have the air free from odors. It is a well-known fact that milk will readily take up odors, and, for this reason if no other, a clean milk house is neces-

sary if the milk is to be properly handled. Flies and other insects may be kept out of the milk house by having the doors and the windows properly screened. A good supply of fresh water is one of the requirements of a well-equipped milk house.

The milk room should be provided with facilities for heating a liberal supply of water for washing and sterilizing the utensils. This may be done on a stove or by turning steam into a half barrel. Either boiling water or steam will do efficient sterilizing if properly used. If a supply of steam can be had, the sterilizing process can be simplified by placing all of the utensils in a sterilizer, where they are all treated at one time with less labor than is necessary to thoroughly scald each piece with boiling water. There are several forms of good, efficient sterilizers on the market of the general type shown in figure 136. All of the utensils used during the entire day can be sterilized at one time in one of these machines.

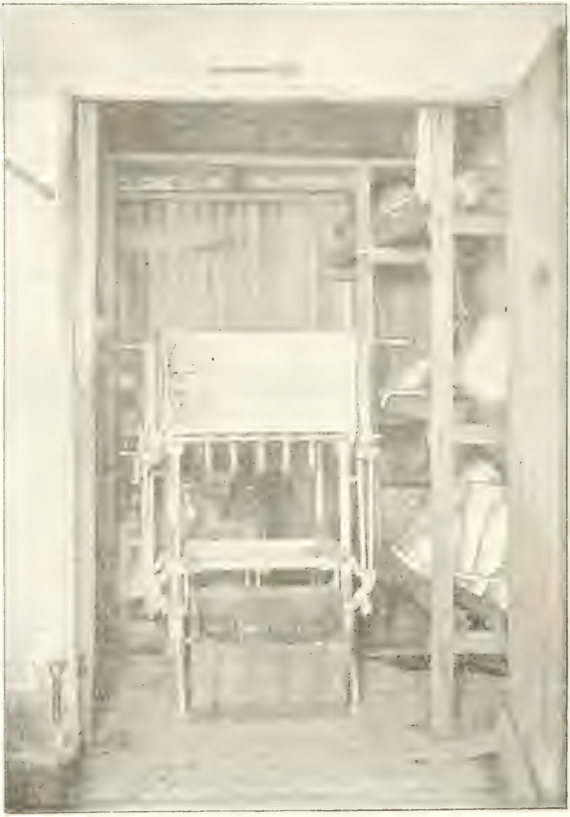


FIG. 137.—*A stationary sterilizer constructed of concrete and hollow tile. The racks and doors are of wood*

Larger forms of stationary sterilizers can be built of concrete or hollow tile, as shown in figure 137. If a steam sterilizer is used, the utensils will be dried by their own heat if the steam is allowed to escape immediately after the heating period. The door can then be closed, and the utensils are thus protected from contamination until ready for use. The length of time necessary to sterilize the utensils, or to heat the sterilizer and its contents to the temperature of the steam, should be determined. In the small iron sterilizers, this requires only a few minutes, while in

the large concrete or tile sterilizers, it may require from twenty to thirty minutes.

COOLING

If the bacteria count of milk is to be kept low, it is absolutely necessary to keep milk cool. Not all bacteria multiply at the same rate, but some of them multiply as often as every twenty minutes under favorable conditions. It is easily seen that even with a small initial contamination, the bacteria count of a sample of milk would, under favorable conditions, soon amount to hundreds of thousands of germs per cubic centimeter. The manner of cooling milk on farms varies, but the method used does not matter provided a few precautions are observed. The milk should be cooled quickly in order to prevent bacterial growth, as shown by the following table:

EFFECT OF DIFFERENT TEMPERATURES FOR TWELVE HOURS ON THE GROWTH OF BACTERIA AND ON THE KEEPING QUALITY OF MILK

I	II
Kept at 45° F. Number of bacteria, 9,300 Curdled in 75 hours	Kept at 50° F. Number of bacteria, 18,000 Curdled in 72 hours
III	**IV**
Kept at 55° F. Number of bacteria, 38,000 Curdled in 49 hours	Kept at 60° F. Number of bacteria, 453,000 Curdled in 43 hours
V	**VI**
Kept at 70° F. Number of bacteria, 8,800,000 Curdled in 32 hours	Kept at 80° F. Number of bacteria, 55,300,000 Curdled in 28 hours

The cooling should be done in a place free from dust, odors, flies, and contamination from cats and dogs. The cooler, or the utensil in which the milk is cooled, must be clean and, as far as possible, sterile. Care must be taken to prevent the refrigerating substances from spattering into the milk. Probably one of the most satisfactory methods of cooling milk on farms is to set the cans of milk in a tank of ice water. Any tank may be used for the purpose, but one made of cement is best because it is durable and easy to clean. One thing must be emphasized, that is, the necessity of stirring the milk at least every ten minutes during the process of cooling. If the milk is not stirred, that around the inside of the can will cool rapidly, while that in the center of the can will remain comparatively warm.

THE CARE OF MILK IN THE HOME

If the producer and the dealer follow out the suggestions given in this lesson, the consumer will receive clean, cold milk. After the milkman

has left the milk at the consumer's door, the consumer should see that the milk is properly cared for until time for use. If possible, the consumer should buy bottled milk and should keep it in the bottle until used. If unbottled milk is bought, it should, if possible, be received from the milkman by some member of the household and poured at once into a clean vessel. Milk may be contaminated by cats or dogs if it is not properly cared for immediately after delivery. Even bottled milk may be so contaminated if the cap is not protected. Milk should not be allowed to remain exposed to the rays of the sun, for milk thus exposed, even if it has been delivered in good condition, may sour within a few hours. Milk should be placed in a refrigerator or some other cool place, because, except in cold weather, it cannot be kept without some cooling agent, such as ice or cold air. The atmosphere in which milk is kept should be free from odors. The top of the bottle should be carefully wiped or rinsed before the milk is poured from it, so that the dirt that may have collected there will not get in the milk. After the bottle has been emptied, it should be cleaned and set in its proper place so that the milkman may collect it when delivering the next day's supply of milk. If any infectious or contagious disease, such as typhoid fever, scarlet fever, diphtheria, and the like, should break out in the family, no bottles should be returned to the milkman without the knowledge of the attending physician, as this may be a means of transmitting the disease to another family.

ADVANCED READING-COURSES

In order to meet the growing demand for systematic home study courses made by those who are unable to attend even a twelve weeks' winter course at Cornell, advanced reading-courses are offered in fruit growing and vegetable gardening. A third course in poultry keeping is in preparation. Poultry keepers who desire to study further than is possible by means of the reading-course lessons on poultry may register now for information that will be available later in regard to the advanced reading-course in poultry husbandry.

The two courses now offered are conducted by means of a textbook, questions, and correspondence. Statements on important points are prepared by the students, and are graded by an instructor and returned with helpful comments and suggestions. In this way the courses present an opportunity to have opinions and conclusions that are the result of study or experience, reviewed by an expert. The only expense connected with either course is the purchase of a textbook at a nominal price. As the textbook is recognized as a standard book, it is well worth owning, especially at the reduced price offered to members of the course.

The advanced reading-course in fruit growing offers to fruit growers up-to-date information on successful orchard practices and marketing problems. Some of the subjects covered in the course are: selecting varieties, orchard culture, fertilizers, cover crops, pruning, orchard insects, diseases of fruit trees, spraying, renovating old orchards, picking and handling fruit, storing fruit, grading and packing, marketing, and advertizing. The course is composed of twenty-two lessons. The student is encouraged to carry forward his work in the light of his own experience, and to make the connection between text and orchard as intimate as possible. The following is an outline of the nature and the requirements of the work given in this course. The chapters in the textbook are studied consecutively, one at a time. The student's purpose should be to study, and not merely to read; therefore each chapter should receive considerable time and thought. The best results will be obtained by setting aside a definite time each day for the work. After making a careful study of each chapter, clear and concise answers should be made to the questions on it without referring to the text. In general, it is expected that the course will be completed within six months. The student should do the work regularly, covering at least one chapter every week, for by so doing the interest in the course will not drag and better results will be obtained.

The advanced reading-course in vegetable gardening is conducted similarly to the course in fruit growing. Additional references to books and periodicals, to which the reader may have access, are suggested, and supplementary reading is encouraged. A list of free bulletins and directions for obtaining them is furnished. Every effort is made to help the student make application of his studies to his local problems. This course is composed of sixty lessons, forty of which offer brief, complete discussions on as many different vegetables, making the course especially thorough and practical. Although the problems of vegetable gardening are discussed from a commercial standpoint, the home gardener may easily adapt the information to his needs.

Any resident of New York State who desires to enroll in the advanced reading-courses in either fruit growing or vegetable gardening, or wishes to receive information later on the advanced reading-course in poultry husbandry, should write to the Supervisor of the Reading-Course for the Farm, College of Agriculture, Ithaca, New York.

AVAILABLE READING-COURSE LESSONS FOR THE FARM, ARRANGED BY SERIES

Residents of New York State may register for one or more of the series mentioned below by addressing The Cornell Reading-Course for the Farm, College of Agriculture, Ithaca, New York.

SERIES		LESSONS
The soil	74	Introduction to the principles of soil fertility
	42	Tilth and tillage of the soil
	50	Nature, effects, and maintenance of humus in the soil
	70	Soil moisture and crop production
	78	Land drainage and soil efficiency
Poultry	80	Incubation
	10	Feeding young chickens
Rural engineering	8	Knots, hitches, and splices
	*59	Sewage disposal for country homes
Farm forestry	12	The improvement of the woodlot
	28	Recent New York State Laws giving relief from taxation on lands used for forestry purposes
	40	County, town, and village forests
	62	Methods of determining the value of timber in the farm woodlot
The horse	46	Feeding and care of the horse
	56	Practical horse-breeding
Dairying	16	Practical dairy problems
	32	Composition of milk and some of its products
	54	The dairy herd
	60	Farm butter-making
	82	Cream separation
	86	The production of clean milk
Fruit growing	22	The culture of the currant and the gooseberry
	36	Culture of red and black raspberries and of purple-cane varieties
	48	Culture of the cherry
	52	Culture of the blackberry
	72	Culture of the grape

*Lesson for the Farm Home.

SERIES		LESSONS
Farm crops	20	Alfalfa for New York
	24	The rotation of farm crops
	66	Meadows in New York
Stock feeding	26	Computing rations for farm animals
Vegetable gardening	34	Home-garden planning
	58	Planting the home vegetable garden
Plant breeding	38	Principles and methods of plant-breeding
	44	Methods of breeding oats
	68	Improving the potato crop by selection
Country life	64	The rural school and the community
	76	Birds in their relation to agriculture in New York State
Insect	84	Insects injurious to the fruit of the apple

The above list is correct to April 15, 1915. The demand may at any time exhaust the supply of particular numbers. Requests will be filled as long as the supply lasts.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 86 | APRIL 15, 1915 | DAIRYING SERIES No. 6

THE PRODUCTION OF CLEAN MILK

DISCUSSION PAPER

A discussion paper is sent with each reading-course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully, and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading-course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, INSECT, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, readers should sign and return this discussion paper, whether the questions are answered or not.* By means of reading-course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading-course work, and also for names and addresses of any residents of New York State likely to become interested in the Cornell Reading-Course for the Farm.*

(In answering questions, attach additional paper if needed and number the answers.)

1. Which do you feel is more important in producing clean milk, methods or equipment?

2. Is it very much more expensive to produce clean milk than dirty milk?

3. What are the most important steps in keeping the bacteria count of the milk low?

4. What is the proper method of cleaning dairy utensils?

5. What should be the temperature of the water used for scalding dairy utensils?

6. Why are healthy cows necessary in the production of clean milk?

7. What are the five most important points mentioned under equipment in the score card?

8. What are the six most important points mentioned under methods in the score card?

9. What do you think is the chief value of a score card?

10. What are you doing to raise the score of your dairy?

Name...

Adress...

Date...

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 88 | MAY 15, 1915 | POULTRY SERIES No. 3 revised

FEEDING YOUNG CHICKENS

CLARA NIXON[1]

The important objects to be accomplished in the feeding of young chickens are: (1) To bring to maturity or to marketable size and age as large a proportion of the hatch of chicks as possible; (2) to enable the chicks to develop large, strong, well-proportioned frames and good plumage for their variety; (3) to provide for as rapid a growth as is attainable, at as low a cost as is consistent with other requirements. In the fulfillment of these purposes the following factors must be considered: (1) The eggs must be incubated properly. (2) The chicks must not be left too long in the incubator after the completion of the hatch; they should be removed to a nursery, or a brooder, when they are thirty-six hours old. (3) The chicks must be strong and vigorous when taken from the incubator. (4) They must be properly cared for and skillfully fed.

ESSENTIALS IN FEEDING

Cleanliness.—All the pens, the food and water dishes, and everything used about the chicks should be carefully cleaned and disinfected at

[1] Revised by H. P. Buchan.

frequent periods. This care should begin before the chicks are put in the brooders and should continue throughout the entire time of brooding. As soon as the litter becomes damp or soiled, it should be removed, and the pens should be thoroughly swept and disinfected before the litter is renewed. To a considerable degree, careful cleaning will prevent the tracking of filth into the food. The food dishes should be cleaned frequently in order to prevent contamination of the food supply, and the dishes for water should be washed once daily and scalded once each week. Drinking water should be supplied in vessels of such a form as will render impossible the fouling of the water by the chicks. Food should never be allowed to accumulate in the litter, since it is thus likely to become spoiled and unfit for the chicks. Neglect of sanitary precautions furnishes a fruitful source of disease.

Fresh, untainted food.— Spoiled food or musty food of any kind should never be given to young chickens. Moistened food spoils very quickly in summer, and for this reason only a quantity sufficient for one meal should be mixed and any food that becomes even slightly soured or moldy should be thrown away. Cracked grain often heats and becomes musty and, if fed, will cause serious bowel trouble in chicks; therefore, if only one ingredient in a quantity of chick feed of this kind has become musty while in storage or in any other manner, the entire lot should be discarded. Beef scrap manufactured from tainted meats may also prove dangerous food. A convenient method of testing beef scrap is to warm a small quantity by holding it in the hand. If the odor of the warm beef scrap is like that of cooked or even scorched meat, there is probably nothing unwholesome about it; but if the odor is similar to that of decaying flesh, the scrap is wholly unfit for young chickens. Slight mustiness in grain may be detected in the same way.

Quantity and quality of food.— It will readily be conceded that if chicks are not given sufficient food to supply their bodily requirements, they cannot be expected to grow satisfactorily. It is equally true that the food may be abundant but of such a quality that it will not yield sufficient nourishment. For example, chicks fed on a ration consisting largely of bran or some other material containing a large proportion of indigestible fiber could not eat enough of the food to supply the needs of their bodies, although their crops might be constantly full. On the other hand, chicks fed chiefly on beef scrap or on sour milk curd would, in their efforts to fill their crops, get more food material than they could possibly digest. In the first case the chicks would be starved, and in the second they would be overfed. Chick foods sometimes contain a high percentage of small seeds encased in a hard shell, such as millet. The digestive organs of young chickens may not be able to crush this shell, and the

chicks may thus eat a large quantity of the grain while obtaining little nourishment from it.

Young chickens should be given as much wholesome food as they will eat, but they should be made to clean it up once a day. If they fail to do this the remaining food should be removed, and no more should be given until signs of hunger appear. The chicks should be kept in such condition that they are eager for food at feeding times, but should be sent to roost with full crops; and unless the attendant is to be at the brooder by daylight or soon after, a little grain should be left in the litter at night so that the chicks may find it the first thing in the morning. The best time to stint the chicks is at the morning meal; they are then more active and will hunt vigorously for every scrap of food left in the litter.

Cracked and ground grains.— Chicks appear to need both cracked and ground grain: the latter, because the nourishment is more easily and quickly available; the former, because the additional energy needed to reduce the larger food to available form tends to strengthen the digestive system. The difference in the form of the food also furnishes a variety in the ration, and the chicks tire less quickly of their food. If ground food is given at night, the crops of the chicks are more quickly emptied than is the case when their evening meal is of cracked grain.

Animal foods.— Fowls seem to need animal food. In the natural state the chicks are reared at a season when the supply of insects and earthworms is abundant, and the mother hen exerts herself to procure this food for her brood. Since chicks reared in brooders are under artificial conditions, the supply of insects is very limited and animal food of some sort must be furnished to remedy this deficiency. The material generally preferred for this purpose is beef scrap. If fresh and untainted, this gives very good results when fed in such a manner that the chicks are not obliged to eat more of it than they desire. In an experiment conducted at this experiment station in 1909, chicks allowed free access to beef scrap from the first meal ate, during the first six weeks, from 5 to 8 per cent of their total food in this material. In another experiment, the data of which have not been published, the chicks that had hopper-fed beef scrap with cracked grain and ground food, consumed in beef scrap, during the first eight weeks, from 8 to 10 per cent of their total food, excluding green food; the results were apparently good. One flock, however, was given the mash mixture and beef scrap, with no cracked grain. For this flock the quantity of beef scrap consumed was more at times than all the other food. Eighty-nine per cent of these chicks died of digestive troubles before they were seven weeks old, probably because of their abnormal consumption of a highly concentrated food.

Infertile eggs are sometimes used for the animal food. These should

be given with caution, however, as they are very concentrated and may cause digestive troubles if fed in too large quantity.

Sour skimmed milk and its products are greatly relished. They are desirable foods and should be used whenever they can be obtained at a reasonable cost. In the Department of Poultry Husbandry at this college, sour skimmed milk or buttermilk is considered almost a necessity in feeding and rearing young chickens. If sour milk curd is fed, care must be taken that the chicks do not get too much. If the milk is given as drink, an unlimited supply at first might cause bowel trouble; after the chicks have become accustomed to it, they may have all they want. Skimmed milk is not to be used as a substitute for water.

The value of commercial milk albumen has been tested at this experiment station, but in this case it did not give so good results as did skimmed milk. How far milk products may be substituted for meat scraps and meat meals in chick feeding has not been proved, although in a test of seven methods of feeding chicks, those chicks that had no milk ate from 5 to 7½ per cent of their total food, excluding green food, in beef scrap, while those given a mash moistened with skimmed milk or a powdered milk solution ate only from 4½ to 5½ per cent of their total food in beef scrap.

Green foods.— Green foods are greatly relished by chicks and seem necessary to their best growth. These foods furnish wholesome nourishment at low cost and supply bulk to a chick ration without excess of fiber. Chicks should be given all the green food they will eat. After the first few days this is best supplied by giving the chicks access to a grass run. Until the chicks can go out into the yards, green food should be furnished them.

Lawn clippings are often obtainable in the summer. These are much relished, but they should be used when fresh and crisp. Fresh clover or alfalfa is very good; it should be shredded fine if given to the youngest chickens. The very young chickens like fresh sod, chickweed, or lettuce, and they are able to pick off the tender leaves; lettuce, however, is often too expensive to use in this way. The older chicks enjoy the leaves and the blossoms of vetch. Sprouted oats are very good and may be provided at any time of the year. The following description of the process of sprouting grain is reprinted from a bulletin of the Cornell University Agricultural Experiment Station:

The operation of sprouting grain as a green food requires considerable expense for labor. Sprouted grain, however, appears to have some advantages over other forms of green food, which justify the expense. This is particularly true in the feeding of young chickens during the season when they cannot have access to the ground.

One of the difficulties which has been experienced in the feeding of sprouted grain is the development of molds. In order to kill smut or mold spores, it is recommended

that the grain used for sprouting be treated with formalin. To do this, a large quantity of grain should be treated at one time in order to save expense. One pint of formalin added to thirty gallons of water will treat thirty bushels of oats. The liquid should be sprinkled over the grain, and thoroughly mixed with it. Success will depend largely on the thoroughness of the mixing. The pile of wet grain should then be covered with blankets and allowed to remain for twelve hours. The blankets should be removed and the grain stirred twice a day, until dry, requiring usually about two days. It should then be bagged in sacks, which have been sprayed with a formalin mixture of the same strength as used in treating the oats. The grain can then be used as desired for sprouting. The trays should be sprayed thoroughly with the formalin mixture each time they are used.

For sprouting, soak in warm water one ten-quart pailful of oats for twenty-four hours. Pour this grain on a tray. It will fill the tray level full. Sprinkle each trayful of grain with warm water each morning. The grain must be kept damp all the way through the mass if it is to sprout uniformly. The time required for the grain to sprout and grow will depend largely upon the temperature of the room, which, ordinarily, should be kept at sixty to seventy degrees Fahrenheit, or warmer. In a room not artificially heated, during the spring of the year, in this State, about seven to ten days are required to sprout the grain and grow the leaf about three inches high.

For young chickens it is best to feed the grain when the sprouts have reached a length of two inches; if allowed to grow longer, they are likely to become tough. Chicks will eat both sprouts and roots, and they will eat the grain also as soon as they are large enough to swallow it. For the first week it is better to shred some of the material and scatter it over the food, so that all the chicks will learn to eat the green food. The sprouted grain may be cut in squares from the trays and placed in the pens for the chicks to peck at. Care should be taken to give not more than will be eaten.

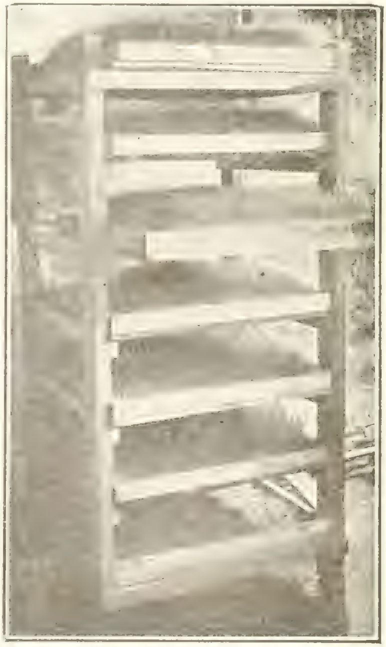


FIG. 138.—*A rack for sprouting oats*

The grain may be sprouted in shallow boxes or in well-drained flats kept in a living room, if needed for only a few chickens. In case a larger quantity is desired, a rack similar to that shown in figure 138 may be used. This was adapted from a device used at the Maine Agricultural Experiment Station.

Ash, grit, and charcoal.— Growing chicks need a certain amount of mineral matter for use in bones, muscles, and feathers, consisting in large part of lime in some form. Ash is not supplied in sufficient quantity by the grains and the green foods; in the natural environment the birds

probably obtained it from the soil. Most grain foods contain less than 1 per cent of ash, while meat scrap and meat meals have from 4 to 5 per cent; animal meal has from 30 to 40 per cent of ash, and bone meal and granulated bone contain from 60 to 70 per cent. That additional mineral matter is needed by fowls was proved by experiments at the Cornell University Agricultural Experiment Station, where it was shown that the bones of fowls that were kept from the ground and deprived of additional lime in the form of oyster shells, bone meal, and similar substances, had much lower breaking strength than had those of other fowls kept under similar conditions but supplied with oyster shells. Oyster shells do not seem to be desirable for young chickens, but the mineral matter needed may be supplied easily and cheaply in the form of bone meal or of fine granulated bone. The bone meal seems better for the younger chicks, and it may be given with the dry mash or with the moist foods. If granulated bone is used, care should be taken that it contains no fine, sharp splinters, as these might injure the digestive tract of the chicks.

Grit seems necessary for the health of the chicks, and from the first meal this should be supplied in the food in such a manner that the chicks must find it. They will soon learn to look for it.

Fine granulated charcoal should be included in the food because of its good effect on the health of the chicks. It seems to be a preventive of some digestive troubles. The chicks eat this material with great relish, and they may be given as much of it as they desire.

Palatability of food.— If chicks are forced to eat food that is distasteful to them, they will eat as little as possible. Such feeding soon results in slow growth and high mortality, especially if the stock is very young; an unpalatable ration is therefore an expensive one, even though the first cost may be small. A single food material that the chicks do not relish may spoil the effect of an entire ration, particularly if the material is in a ground food mixture. Food that the chicks like is looked for eagerly and eaten with a relish, an active scramble often being an accompaniment of the meal. If a sufficient quantity is given so that the smaller chickens are not robbed of their share, all are benefited by the exercise. Eager anticipation is said to promote the flow of the digestive juices, thus aiding in the digestion of food.

Variety.— Variety in a ration is essential for the following reasons: (1) It renders the food more palatable; (2) it is likely to result in a better supply of the materials necessary for growth and for bodily maintenance; (3) there is less danger of injury from overfeeding or from underfeeding the chicks. If chicks are given only one or two kinds of food, they are likely to become repelled by its sameness. No one nor two foods will supply all the materials needed.

Variety in a ration may be defined as the result of an effort to furnish all the necessary materials and conditions of food. For example: Chicks fed altogether on corn products would be given an excess of fat-forming materials, or carbohydrates, and would receive very little of the food elements required for the formation of bone, muscle, and feathers; on the other hand, chicks fed entirely on beef scrap would receive an excess of muscle-forming material, or protein, with too little of the food elements necessary for the production of fat, heat, and energy. In either case the chicks would be insufficiently nourished, even if they were given all they could eat. A combination of these foods would be more satisfactory, though the ration might still be lacking in bulk. In order to overcome this deficiency some bulky food, such as bran or alfalfa meal, might be added. Either or both of the last-mentioned foods would not make a particularly appetizing mash, and therefore corn meal, and perhaps wheat middlings, should be supplied in order to render the ground food more tempting; and some bone meal should be added to make up the deficiency in ash. Chicks would tire of corn alone as a cracked grain, and so it should be mixed with wheat and perhaps with hulled oats. This ration would still be very dry and somewhat concentrated, and therefore green food should be supplied.

Such a combination of materials as described would make a good variety of palatable foods, and not a large amount of any one food would be eaten. If there were not enough of one food, there would probably be plenty of another, and the chicks would not become too hungry. If they did not have all the mash they could eat, and the lack were made up with cracked grain, they would not become cloyed with concentrated foods.

Changes in ration or in methods of feeding.— Whenever it is desired to change from one food to another, the change should be gradual. To the original ration a little of the new food should be added, the proportion being increased at each feeding time until the change of ration will have been accomplished. If the new ration is a suitable one, the gradual change is likely to prevent any digestive trouble, which might otherwise occur. In case it is desired to give the chicks some concentrated food that they particularly like, such as green cut bone, only a very small quantity should be given at first, the amount being increased by slow degrees until the chicks are receiving as much of the food as it is advisable to give them.

As chicks grow older, the number of feedings should be decreased. The number should not be dropped at once from five to three, but should be changed first from five to four, then from four to three, chicks in confinement being given for a day or two a little chopped onion or other

well-liked food at the usual feeding time. This attention will prevent restlessness, and may avert serious trouble and loss from crowding, toe-pecking, or other disturbance.

FIG. 139.— *Two styles of water fountain suitable for chicks. A is more desirable than B because, in the latter, chicks may crowd into the openings and be unable to get out. In order to fill the fountain, turn the top part upside down, fill it, cover it tightly with the pan, and reverse the fountain*

Constant supply of clean water.— Fowls seem to crave a large quantity of moisture, especially when eating dry food or rations rich in protein. Serious results may follow if this moisture is not obtainable. It is often observed that when hens are deprived of their water supply for even a short time, the subsequent loss in egg production is marked. The apparent effect on the growth of the chicks is not so immediate, but if their water fountain becomes dry they will show their discomfort by constant efforts to drink. Chicks left too long in an incubator seem to suffer greatly from thirst. The water supply should be fresh, clean, and constant, and should be furnished in vessels that will not allow the down of the chicks to become too wet. Drinking water may be supplemented, but not superseded, by skimmed milk.

FIG. 140.— *Parts of water fountains shown in figure 139. The small braces in the pan of A are not desirable because of the greater danger of spilling the water when reversing the fountain after filling*

Two styles of water fountain are shown in figures 139 and 140. The fountain should be large enough to contain at least a half-day's supply of water and to enable a considerable number of chicks to drink at the same time, sufficiently light to be handled easily, strong enough to be durable, of such a form that it may be washed and scalded without difficulty and will be easy to fill, and shaped so that the chicks cannot perch on it and foul the water. A serviceable drinking fountain may be made from a tomato can and a pie tin. The tin should be large enough so that the space between its edge and the side of the can will permit the chicks to drink with ease. The open end of the can should be unsoldered and three or four notches cut in the edge, the notches being a little shorter than the depth of the pie tin. The can may then be filled, covered tightly with the pie tin,

and reversed. The water will rise in the tin to the height of the top of the notches.

Access to fresh earth.— Chicks appear to obtain from fresh earth something necessary to their health, and they should be supplied with some fresh soil soon after they are removed from the incubator. Sand or dry earth does not satisfy the need. Fresh sod or a chickweed or a lettuce plant with a handful of soil on the roots, gives the right combination, supplying green food and earth and tempting the chicks to activity.

Exercise.— Healthy chicks kept in small pens and properly fed will grow very rapidly for the first week or ten days, but will of course get little exercise. They usually become restless at this age and appear anxious to get out of the brooder. If after two weeks they are removed to a larger run, it will be found that they are much weaker and less active than others of the same age that have been similarly fed but have had wider range. In most cases the subsequent mortality is considerably higher in flocks that have been confined in small pens.

When chicks are hatched early in the season, it is often impossible to give them an outdoor run. An incentive to exercise must then be supplied. Cracked grain scattered in litter, a piece of sod, a chickweed or some other green plant, or a block of sprouted oats will keep the chicks busy for some time unless they are having other foods in too great quantity. A small amount of onion or of fresh, lean meat, chopped fine, will be scrambled after and fought for as long as a scrap remains.

Chicks kept in small yards, if allowed to become idle, are likely to develop bad habits, such as pecking one another's toes, pulling feathers, or crowding. Unless something is otherwise materially wrong, any tendency to these vices may be broken up by attracting the attention of the chicks in another direction and by keeping them occupied. If the tendency is allowed to become a habit, however, it will be hard to overcome. Active, busy, properly fed chicks do not ordinarily acquire bad habits, although they may crowd if the brooder is not opened early in the morning; and in their efforts to get out, there is danger that some may be trampled to death.

Care.— The rapid development of young chickens renders constant care and watchfulness of the utmost importance. Any slight appearance of discomfort or of drooping may be the first indication of a condition that will prove a menace to the flock. It is never safe to wait long for developments; the cause of the wrong condition should be sought and remedied immediately — to-morrow may be too late to save the flock.

By careful observation from the beginning, the person who feeds the chicks may learn to know them and will be able to detect at once a change in their condition that the casual observer would never see. For

instance, carelessness in feeding may induce a slight digestive disorder. If the condition is observed at once, the evil may be corrected, while continued carelessness will cause serious loss to the owner. Persistent care and watchfulness will very often prevent trouble and loss. The removal of damp litter will obviate a menace to every chick in the brooder, as one of the common molds, aspergillus, adapts itself readily to the membrane lining the air passages and air sacs of the chick, sometimes causing high mortality.

It cannot be too strongly emphasized that untiring care is absolutely essential to the success of any method of chick feeding. Young chickens are very small creatures, and the loss of a few may seem a trifling matter; but in a flock of fifty, one chick is two per cent of the flock. Any method of feeding is expensive if it permits a high mortality. Vigilance will often greatly reduce mortality.

GENERAL DETAILS OF FEEDING

Time of first feeding.— It is believed that the chick derives nourishment from the yolk of the egg, which is enclosed within its abdomen just before it breaks from the shell; and that too early feeding prevents, or at least hinders, the proper absorption of this yolk. Chicks begin to show signs of hunger from thirty-six to forty-eight hours after hatching. They peck at one another's toes and beaks and rush to the front of the incubator when they hear a tapping on the glass door. If given water, they drink eagerly. They are usually transferred to the brooder at this time and are then given their first meal.

The first meal.— Whatever the method of feeding may be, the first food should contain grit, charcoal, and granulated bone, all of very small-sized grains. These should be mixed with the other foods in sufficient quantity to be easily noticed. Cracked grain may be fed at first in a shallow tray or dish containing a small quantity of bran. If a dry mash is used, this will take the place of the bran. Moist food may be given in trays from ten to twelve inches wide, having low vertical sides to prevent loss of the food; enough of these trays should be used to furnish plenty of feeding surface. Common cake tins are satisfactory substitutes for wooden trays. Bone meal should be supplied in the first moist food given. Tender green food should be finely shredded and a small quantity scattered over the other food, and a sod or a green plant with soil on its roots should also be given to the chicks.

Should food be kept before young chickens at all times?— For the first two or three days it seems best that the cracked grain, and the bran or dry mash, should be kept before the chicks in order to make certain that all have plenty of food. The moist food should be removed after each meal

as soon as all have had opportunity to eat. The latter should be given in small quantities in order to prevent waste, and any food that becomes soiled or soured should be thrown away at once.

When the chicks are four or five days old, they should be able to scratch for food in light litter, and the cracked grain fed in this litter should be cleaned up once a day. When dry mash is fed, this is always accessible to the chicks, but it should be given in such quantity that it will be eaten in one day. Any dry mash remaining in the tray should be removed if it becomes soiled.

Training the chicks.— Incubator chicks have no knowledge of what to eat or of where to find food. They will pick up one thing as readily as they will another if it is of convenient size; for this reason, great care is necessary as to any materials left in the brooder. If sawdust is used as litter, the chicks may eat enough of it to cause high mortality. The use of bran as litter is objectionable on the same ground, although in a lower degree; it contains a large proportion of indigestible fiber, and may be eaten instead of more nutritious food. Bright, clean straw, cut an inch or two in length, makes the best litter.

In order to teach chicks what to eat and where to find it, some signal is necessary. From the first, chicks recognize the call of the mother hen. They will come almost as quickly in answer to a sound of tapping, running directly to the source of the sound and following it from place to place. This signal is very useful in teaching them to find food and drink. When the chicks are called to the food dishes their attention should be directed to the food by picking up a small quantity and scattering it before them, dropping some bits on their down. Repeated tapping on the trays and scattering of the food among the chicks seems to awaken their curiosity, and they soon begin to pick the particles from one another's backs and from the food trays. Chicks quickly imitate one another, and when a few begin eating, their example is followed by others.

The majority of the chicks should eat a little when first fed, although a few of the youngest may not be hungry. The latter may safely wait until the next meal. It may be necessary to push the chicks back under the hover after the first feedings, because they are not yet wise enough to return to a warm place and may become chilled if left outside the hover. In the morning of the second day the hover should be raised, and all the chicks should be forced out to the food dishes. By this time the greater proportion will know where to find food and drink; the backward ones should be encouraged, otherwise some of them may starve. A small quantity of cracked grain may now be scattered in light litter, the attention of the chicks being attracted to this action. If some of the grains strike the chicks in falling, the food is more quickly seen.

After the first few days, or as soon as all the chicks have learned to find the different kinds of food, the grit, the charcoal, and the granulated bone may be put into a separate dish, and the green food need not be so finely shredded. Under favorable circumstances the chicks should be allowed to leave the brooder when three days old, but they should not be forced outside. In order to teach the chicks the way back into the brooder, a little train of food may be laid from the ground along the entrance and to the inside of the brooder. When a few of the chicks find this food, most of the others will follow them inside, but care should be taken that even the most backward learn quickly the way to the source of heat. A little food scattered outside the brooder will encourage the chicks to get out on the ground; but the greater part of their food, including some of the green food, should still be put in the brooder. On rainy days, when the chicks remain indoors, it is especially necessary that they be kept busy. The meals should be somewhat lighter on such occasions, and between feeding times a little onion, lean meat, or other "chickens' dainty," cut to a suitable fineness, should be scattered in the litter. Only a quantity sufficient to induce a scramble should be given.

The daily meals.— For the first two weeks the chicks are usually fed five times a day, and should be given all they will eat. After the second or third day they should be required to clean up their food once daily. Fairly good results can be obtained by feeding chicks three times instead of five times a day from the start, but, for rapid growth, five times a day will produce the best results. The number of meals is later reduced to four and then to three, and finally the method is changed to hopper feeding; the age at which these changes are made being influenced by the conditions under which the chicks are reared. If kept in small yards, the chicks should be fed more often and given a smaller quantity at a feeding than if allowed a larger run. In case chicks accustomed to range are kept for a day in the brooder, it may be best to increase the number of feedings, giving a less amount at each meal.

The morning meal should consist of grain, and the conditions should be such that the chicks will be obliged to hunt for the food. The amount fed must be controlled by the appetites of the chicks. If they become overfed, no more food should be given until they are eager for it. They should not be fed with any particular material that becomes distasteful to them. The subsequent feedings should be sufficient to satisfy the appetite. Green food should be given at least twice a day. At night the chicks should have all the food they will eat, with just a little left over to be eaten by the earliest light. They should not be fed in the morning until they are hungry.

Small hoppers or boxes should be used for grit or for charcoal; one

style of hopper is illustrated in figure 141. These should be placed in the pens at the end of the first week and should be fastened securely so that they cannot tip over, being so placed that it will be impossible for the chicks to crowd behind them.

The trays used for dry ground food are shown in figure 142. These trays are made of smoothly planed wood, and are thirty inches long, four inches wide, and of three different heights: two inches for the youngest chickens, three inches for the next size, and four inches for those still larger. A piece of wire screening of one-half inch mesh is loosely fitted into the tray, being placed over the food in order to prevent waste.

FIG. 141.—*Grit hopper. This hopper is used in feeding the mixture of grit, granulated bone, and charcoal to chicks more than one week old*

When the chicks are from six to eight weeks old, a covered feed trough may be used as shown in figure 143. This trough is made of planed wood, and has a raised cover attached to two upright pieces that slide loosely into guide irons at each end of the trough. It is sometimes necessary to fasten projecting strips of wood along the top edge of the trough, running upright wires between these and the raised cover at intervals of three inches, in order to prevent wasting the food.

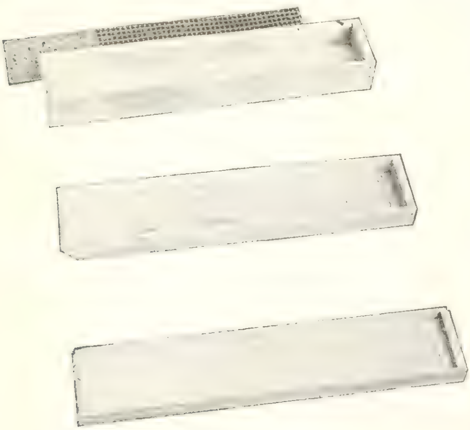


FIG. 142.—*Trays used in feeding baby chicks. A loose piece of wire screening, slightly smaller than the top of the tray, is placed over the food to prevent waste. The mesh of the screening should be of half-inch size*

Culling.—Chicks of different sizes should not be fed together, as the smaller ones may be robbed of their rightful share of the food. Healthy chicks of the same age and breed and similarly fed are usually much alike in size and in activity. If the flocks show uneven growth, the smaller chicks should be separated from the larger ones. Chicks of the same size may run together, unless those that are older are very small for their age; in such a case the lack of development should be regarded as a sign of disease.

Diseased and healthy chicks should not be allowed to run together.

The most frequent cause of the communication of disease from one bird to another is by means of food and water. By providing fresh, wholesome food and drink and by removing the sickly chicks from among the healthy ones, this danger is largely avoided.

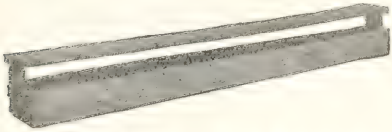


FIG. 143.— *A feeding trough for the larger chicks. This is used indoors, or placed under the colony houses. The top is removable, thus making the trough easy to fill and to clean*

Feeding growing stock.— The growing stock should be placed on larger range, the cockerels being removed to separate quarters except such as are to be kept for breeding purposes. These chickens may now be hopper fed, and the ration should be a generous one. The grain ration may contain a larger proportion of corn and no hulled oats. Very early pullets may be fed largely on whole grain if it is desired that they shall not begin laying early. Later pullets may be hurried on to early laying by feeding them with a ration containing a larger proportion of ground grain and of beef scrap.

An outdoor hopper is desirable for growing stock. This should be set in a place sheltered from the prevailing winds and where the sun will shine on it. The Cornell outdoor hopper is illustrated in figures 144 and 145. This hopper is 32 inches wide, 40 inches high, and 4 feet and 9 inches long. It is divided into separate compartments for whole grain, dry mash, grit, and beef scrap.

The dishes for water should be large and numerous enough to supply a liberal quantity, so that the chickens may never be obliged to remain thirsty.

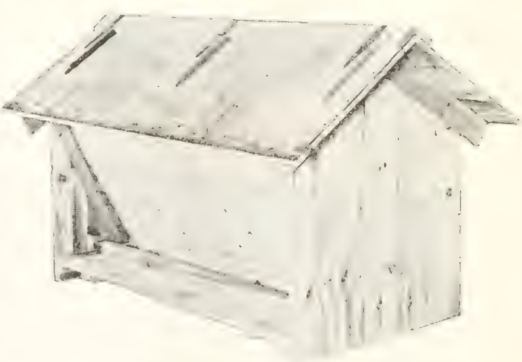


FIG. 144.— *An outdoor hopper used in feeding growing stock when on range*

Shall unmixed beef scrap be always accessible to the chicks?— Opinions differ as to the best method of insuring a plentiful supply of meat food to the chicks. Some poultrymen would add another part of beef scrap to the food mixtures; others would supply beef scrap in a tray or a hopper after the first two or three weeks, giving a limited amount at first and gradually increasing the quantity until beef scrap was before the chicks at all times; still others would allow the chicks all the beef scrap they

wished from the first meal. Any one of these methods would probably be satisfactory, if the ration provides plenty of food materials in good proportion and condition.

At the Cornell Experiment Station it was found that no injury resulted from feeding unmixed beef scrap to chicks of any age, provided they had plenty of other food suitable to their needs. If the ration was deficient in the necessary food elements, however, the chicks in their effort to supply the lack, ate enough beef scrap to cause a high mortality in the flock. It was also found that young chickens having constantly before them a mash containing from twenty to twenty-five per cent of beef scrap, grew very satisfactorily without hopper-fed beef scrap. Since a good dry mash containing a liberal supply of meat food appears to answer all requirements for young chickens, this is safer food for them than is unmixed beef scrap. A wet mash may also be used, if desired. Growing stock on range, having plenty of exercise and finding an ample supply of insects, will not eat enough beef scrap to cause injury.

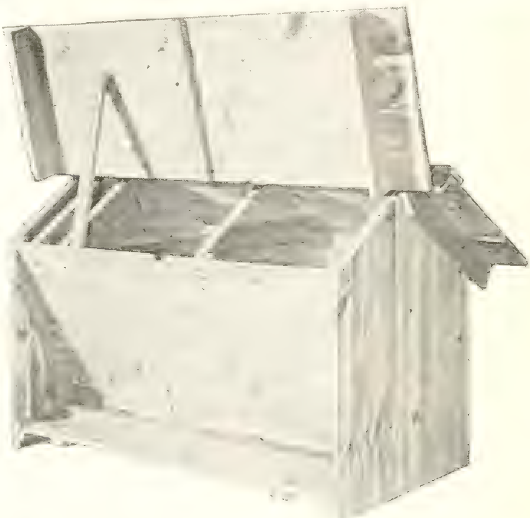


FIG. 145.—*The interior of the outdoor feed hopper, showing compartments that may be used for grain, dry mash, grit, and beef scrap*

Beef scrap should always be carefully inspected before it is fed, in order to make sure that it is free from taint and from mustiness. Sifted beef scrap sometimes becomes musty in storage unless it is kept in a very dry place. In any case, beef scrap should never be supplied to chicks in sufficiently large quantities or under such conditions that it may possibly become musty before being consumed.

The use of condimental foods and salt.— Many preparations guaranteed to produce better health and growth in chicks, with perhaps much less food consumption, are on the market. These condimental foods are expensive and in most instances are of little or no value. If chicks are strong and healthy at the start and are reared under proper conditions, they do not need these foods; on the other hand, if they are weak or have been injured by improper care or food, condimental mixtures alone will not correct the wrong.

Salt does not appear to be so necessary to fowls as to other domestic animals, and it may cause death if given in too large quantity; but mash salted as for human food often seems to be better relished than when fed without the salt. Whether or not salt promotes digestion in fowls has not been proved.

The use of prepared chick foods.— Commercial chick foods that are free from mustiness and do not contain too much millet are often fed with excellent results. As a rule, however, they are too expensive in case the number of chicks to be reared is large. The poultryman who prepares his own chick foods usually saves something on the cost, and by using only the best and cleanest of materials he is, with reasonable care, always sure of the quality of food given. A large variety of grains is not necessary to the growth of the chicks. Corn, wheat, oats (minus the hulls), are sufficient; or wheat fed alone as a grain food or with cracked corn, will give good results.

CORNELL RATION FOR CHICK FEEDING

THE RATION	THE METHOD
Mixture No. 1 8 pounds rolled oats 8 pounds bread crumbs or cracker waste 2 pounds sifted beef scrap (best grade) 1 pound bone meal	One to five days Mixture No. 1, moistened with sour skimmed milk, fed five times a day; Mixture No. 2 in shallow tray containing a little of No. 3 (dry) always before chicks. Shredded green food and fine grit and charcoal scattered over food.
Mixture No. 2 3 pounds wheat (cracked) 2 pounds cracked corn (fine) 1 pound pinhead oatmeal	Five days to two weeks No. 2 in light litter twice a day; No. 3 moistened with sour skimmed milk, fed three times a day; No. 3 (dry) always available.
Mixture No. 3 3 pounds wheat bran 3 pounds corn meal 3 pounds wheat middlings 3 pounds beef scrap (best grade) 1 pound bone meal	Two to four weeks As above, except that the moist mash is given twice a day.
Mixture No. 4 3 pounds wheat (whole) 2 pounds cracked corn 1 pound hulled oats	Four to six weeks (or until chicks are on range) Reduce meals of moist mash to one a day; Mixture No. 4 in litter twice a day; dry mash always available.
Mixture No. 5 3 pounds wheat 3 pounds cracked corn	Six weeks to maturity No. 3 and No. 5 hopper fed. One meal a day of moist mash if it is desired to hasten development.

FURTHER DIRECTIONS

1. Provide fine grit, charcoal, shell, and bone from the start
2. Give grass range or plenty of green food
3. Have fresh, clean water always available
4. Feed only sweet, wholesome foods
5. Avoid damp and soiled litter
6. Disinfect brooders frequently

7. Test all beef scrap before feeding
8. Keep chickens active by allowing them to become hungry once daily
9. Feed *moist* mash sparingly
10. Keep *dry* mash always before the chicks

So far as results of experimental work at the Cornell Station are now available, it seems probable that the proportion of beef scrap in these mixtures might be somewhat increased with benefit to the chicks, provided the scrap used were good and wholesome.

If it is desired that the chickens shall develop slowly, the moist food may be gradually discontinued after the third week.

These mixtures may be continued for the growing stock, being fed from hoppers, and clear beef scrap may be added to the ration if desired.

Adaptation of the ration to conditions.— The above method of feeding has been proved good for large numbers of chicks reared in brooders; it may be adapted to the farmer's flock so that materials that would otherwise be wasted may be given to the chicks. A little cooked breakfast food left from the morning meal may be combined with bread crumbs, a few bits of finely chopped lean meat, or a little hard-boiled egg, and, if bone meal is not at hand, some of the powder from a well-burned bone. Bread slightly moistened with milk may be used without the breakfast food. If finely cracked corn and pinhead oats are not available, wheat screenings usually are, and chicks three or four days old will swallow the smaller kernels. Buckwheat, barley, and rye should not be fed to the chicks.

Table scraps will largely take the place of beef scrap for chicks on a free range, especially if the chicks are reared by hens. If the farmer has animal meal for his stock, it may be used instead of beef scrap in a moist mash, with the table scraps. This will furnish mineral matter if bone meal cannot be obtained. Burned bones will provide bone ash when nothing else is handy.

Good, bright alfalfa or clover chaff (leaves), sifted to remove the dust, is excellent for chicks. It may be scalded and allowed to stand for a few hours, and then given in addition to the green food, or a small amount added to the ground food, after the chicks are a week old.

When chicks are reared by the natural method, the mother hen teaches them what to eat and when to eat it, and their owner has far less trouble about their diet. If possible, hen and chicks should be allowed free range. Plenty of food should be furnished for both and whole corn should be included for the hen. Oats in the hull are not good for chicks because of the undesirable shuck.

A useful feeding coop.— In case chickens of all ages must run together, a feeding coop is desirable. The foundation of the coop is a strong frame three feet by four feet, and two feet high. On the sides of this frame

lath are nailed, far enough apart to admit only the smaller chickens. A tight cover having a hinged trapdoor sufficiently large to allow the food dishes to be passed through, completes the coop. This coop provides a place where the younger chickens may be fed their extra meals and may eat their mash mixture undisturbed. It should be shifted to a clean place from time to time. More than one coop should be furnished, if necessary.

A feeding enclosure large enough to admit a person is preferable when large numbers of chicks are to be reared. This may be of woven wire fencing of the necessary height with mesh of a size that will admit only the smaller chickens.

It is true that in chick rearing, care and feeding must be largely depended on to produce satisfactory results; but good food and effort are wasted on sickly chicks. An absolutely essential factor in the successful rearing of poultry is native health and vigor in the flocks. In order to make possible the production of vigorous chicks the parent stock must be strong and healthy, and must be kept under conditions as nearly as possible like those of the natural state.

ADVANCED READING-COURSES

In order to meet the growing demand for systematic home study courses made by those who are unable to attend even a twelve weeks' winter course at Cornell, advanced reading-courses are offered in fruit growing and vegetable gardening. A third course in poultry keeping is in preparation. Poultry keepers who desire to study further than is possible by means of the reading-course lessons on poultry may register now for information that will be available later in regard to the advanced reading-course in poultry husbandry.

The two courses now offered are conducted by means of a textbook, questions, and correspondence. Statements on important points are prepared by the students, and are graded by an instructor and returned with helpful comments and suggestions. In this way the courses present an opportunity to have opinions and conclusions that are the result of study or experience, reviewed by an expert. The only expense connected with either course is the purchase of a textbook at a nominal price. As the textbook is recognized as a standard book, it is well worth owning, especially at the reduced price offered to members of the course.

The advanced reading-course in fruit growing offers to fruit growers up-to-date information on successful orchard practices and marketing problems. Some of the subjects covered in the course are: selecting varieties, orchard culture, fertilizers, cover crops, pruning, orchard insects,

diseases of fruit trees, spraying, renovating old orchards, picking and handling fruit, storing fruit, grading and packing, marketing, and advertizing. The course is composed of twenty-two lessons. The student is encouraged to carry forward his work in the light of his own experience, and to make the connection between text and orchard as intimate as possible. The following is an outline of the nature and the requirements of the work given in this course. The chapters in the textbook are studied consecutively, one at a time. The student's purpose should be to study, and not merely to read; therefore each chapter should receive considerable time and thought. The best results will be obtained by setting aside a definite time each day for the work. After making a careful study of each chapter, clear and concise answers should be made to the questions on it without referring to the text. In general, it is expected that the course will be completed within six months. The student should do the work regularly, covering at least one chapter every week, for by so doing the interest in the course will not drag and better results will be obtained.

The advanced reading-course in vegetable gardening is conducted similarly to the course in fruit growing. Additional references to books and periodicals, to which the reader may have access, are suggested, and supplementary reading is encouraged. A list of free bulletins and directions for obtaining them is furnished. Every effort is made to help the student make application of his studies to his local problems. This course is composed of sixty lessons, forty of which offer brief, complete discussions on as many different vegetables, making the course especially thorough and practical. Although the problems of vegetable gardening are discussed from a commercial standpoint, the home gardener may easily adapt the information to his needs.

Any resident of New York State who desires to enroll in the advanced reading-courses in either fruit growing or vegetable gardening, or wishes to receive information later on the advanced reading-course in poultry husbandry, should write to the Supervisor of the Reading-Course for the Farm, College of Agriculture, Ithaca, New York.

SUPPLEMENT TO

The Cornell Reading-Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

B. T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 88 | MAY 15, 1915 | POULTRY SERIES No. 3 revised

FEEDING YOUNG CHICKENS

DISCUSSION PAPER

A discussion paper is sent with each reading-course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully, and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading-course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, INSECT, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, the reader should sign and return this discussion paper, whether the questions are answered or not.* By means of reading-course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading-course work, and also for names and addresses of residents of New York State likely to become interested in the Cornell Reading-Course for the Farm.*

(*In answering questions, attach additional paper if needed and number the answers.*)

1. What time do your pullets usually begin to lay? What are some of the essential factors in raising early layers?

2. What are the most common sources of animal food for chicks? Which is preferable?

3. How may green food be supplied to chicks?

4. What is the function of mineral matter in the ration, and how may it be supplied?

5. How may a ration be prepared so as to have palatability, variety, and bulk?

6. Name some of the ways by which the mortality of the chicks may be kept low.

7. When should chicks be given their first food, and of what should it consist?

8. How may incubator chicks be trained to find food and warmth, and to return to the brooder?

9. How may labor be saved in feeding growing-stock?

10. Give a good ration for chick feeding, and state how it should be fed.

Name...

Address...

Date...

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 90 | JUNE 15, 1915 | FARM CROPS SERIES No. 1 revised

ALFALFA FOR NEW YORK

E. G. MONTGOMERY

Alfalfa is one of the oldest cultivated plants of Asia and of southern Europe. It was brought into Mexico by the Spaniards during the sixteenth century. About 1854 it was introduced into California, and its culture has developed rapidly since that time in all States as far east as the Missouri River. The plant has been cultivated continuously for more than one hundred years in the limestone region of New York with considerable success. Although alfalfa was grown in New York State before its introduction into California, the acreage of alfalfa in this State has not shown much increase until recently. According to the Twelfth United States Census there were only 5582 acres of alfalfa in New York in 1899, against 455,000 acres in Colorado, 298,000 in California, and 267,000 in Kansas. The Thirteenth Census, however, shows 35,343 acres in New York in 1909, a sixfold increase in ten years, as compared with 508,000 in Colorado, 484,000 in California, and 956,000 in Kansas.

FIG. 146.—*One season's growth of alfalfa in New York; first, second, and third cuttings*

Doubtless the reason for the slow development of alfalfa growing in New York and other Eastern States is lack of sufficient lime and of the bacteria necessary for cultivation of the crop in practically all soils except those of certain restricted areas. This

deficiency was not known until a few years ago; but with the present knowledge of the subject and of the means for overcoming such difficulties, there is no reason why alfalfa culture should not have a rapid development in the Eastern States.

VALUE OF THE CROP

According to the Thirteenth Census, New York State produced in 1909 the following yields of hay and nutrients per acre:

Crop	Acres harvested	Yield per acre (tons)	Digestible nutrients per acre (pounds)	Digestible protein per acre (pounds)
Alfalfa	35,343	2.46	2,608	517
Red clover	87,267	1.31	1,284	186
Timothy hay	1,078,358	1.08	1,039	60

Average yields are always low, for large areas of poor land are included. According to Bulletin 221 of the Cornell University Agricultural Experiment Station, successful alfalfa growers in this State report yields varying from 3 to 7 tons per acre, the average being 4 tons. This can be expected from any good alfalfa field.

The food value of alfalfa is very high since it is rich in protein, being the cheapest source of that material. Valuing the various digestible nutrients in alfalfa and other standard hays, the comparative value per ton is reported to be about as follows, in Farmers' Bulletin 339, United States Department of Agriculture:

Feed	Value per ton
Fresh alfalfa	$7.00
Fresh clover	5.96
Alfalfa hay	20.16
Clover hay	14.12
Timothy hay	9.80
Cowpea hay	19.76

While alfalfa hay has almost the same analysis as bran, yet it is not so digestible, for it is much coarser. With bran valued at $22.50 per ton, alfalfa would be worth $16.50 per ton, according to feeding experiments conducted at the New Jersey Agricultural Experiment Station.

THE ALFALFA FAMILY

Alfalfa is related, in a botanical sense, to both red clover and sweet clover, being one of that large tribe of leguminous plants having compound leaves made up of three leaflets and known as the Trifolieæ.

In the genus Medicago, to which alfalfa belongs — so called because alfalfa was originally supposed to have come from Media — there are at least fifty species. Those most commonly found in cultivation are the common alfalfa (*M. sativa*), bur clover (*M. denticulata*), black medick (*M. lupulina*), yellow alfalfa (*M. falcata*), and sand lucern (*M. media*); the common alfalfa (*M. sativa*), however, is the only one of the family in extensive cultivation.

Some of these species and several varieties derived from them range in hardiness from semitropical forms to those adapted to extremely cold climates. In general these are arranged according to hardiness as follows:

Kinds suited to the coldest parts of the temperate zone
- Siberian, or sickle

Kinds suited to warm to cool temperate climates; the first four kinds are the so-called hardy alfalfas
- Sand lucern
- Grimm
- Ontario variegated
- Hardy Blackhill
- Common
- Turkestan

Kinds suited to semitropical climates
- Peruvian
- Arabian

The yellow, or sickle, alfalfa is a native of Siberia and never winterkills, but is not very productive, yielding only one cutting a season.

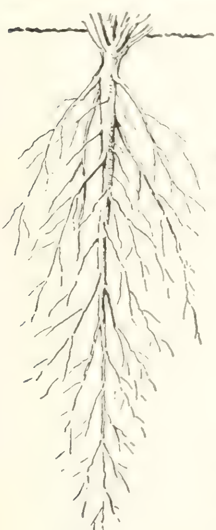
The common and the Turkestan, which is a variety of the common, are hardy as far north as North Dakota and central New York. The Turkestan is considered somewhat less productive than the common, but it is a little more drought resistant. Both these kinds are blue flowered. The so-called hardy alfalfas can be grown from two hundred to three hundred miles farther north than the common and the Turkestan. They have flowers ranging in color from blue through yellow, green, and white. In New York State the common alfalfa should be grown wherever it does well. The more hardy kinds, while more resistant to cold, are not so productive and should be tried only in exposed elevations and in parts of the State where common alfalfa often fails to winter satisfactorily.

The two semitropical kinds are hardy only in climates such as those in southern Texas and southern California.

SOIL REQUIREMENTS FOR ALFALFA

The best alfalfa soils are medium to heavy in texture, with porous subsoil. At one time it was thought that alfalfa was adapted only to deep soils with porous subsoil, so that the roots might penetrate easily to a depth of several feet; at present, however, alfalfa is grown in every State, on practically every type of productive soil except those that are acid. On very heavy soils or on those with a hardpan subsoil, while alfalfa often will grow very well, it is much more likely to winterkill; and on some of the hardpan soils of New York, alfalfa culture is uncertain because of winterkilling.

Tile drainage on these heavy soils not only improves the yield, but also increases the ability to withstand winter freezing. In fact, alfalfa will winterkill on even the best land if it is not properly drained. It is particularly sensitive to standing water during the winter months. In general, the water table should be not nearer than two feet from the surface for more than a few days at a time, and is better at about four feet below the surface.



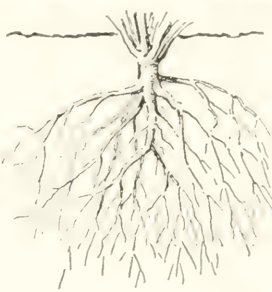


FIG. 147. — *Distribution of roots in a deep porous soil, and in a compact soil. In the first case a long taproot is developed, while in the second case the aproot breaks up into many branches*

The root system of alfalfa varies with soil conditions. In a porous soil, easy to penetrate, the taproot will extend almost straight downward for from 10 to 20 feet, or until the water table is reached. However, if a stratum of hard soil is encountered, the taproot will break up into a much-branched root system. In a very compact soil the roots may not penetrate more than 3 or 4 feet, even when the plants are several years old.

Lime

Field and forage crops vary in their requirements of lime or basic substances in the soil. Redtop and alsike clover will tolerate some acid in the soil, while many of the most important field crops, such as oats and buckwheat, seem to be quite indifferent to the presence of lime so long as the soil is not acid. Certain crops, notedly red clover and alfalfa, are very sensitive to the lack of lime. In order to grow alfalfa, lime must be applied to at least three-fourths of the cultivated soils of New York.

The map herewith (Fig. 148) shows the State divided into four principal soil areas, according to lime requirements for alfalfa. Where the soil has been derived in general from a limestone formation, as in section I, it usually will not be necessary to add more lime. The presence

FIG. 148.— *This chart is intended to show in a general way the variation in lime requirement for alfalfa in New York State. It must be borne in mind that the map is very general, since there are considerable areas even in section III where lime is not required for alfalfa culture.*

In general, the valleys require less lime than do the hills. This is quite true in section IV, where most of the valleys have sufficient lime and most of the hills are deficient. Keeping this in mind, the following statements will serve as a general guide in determining the amount of lime to apply:

Section I, generally enough lime, but where required about 500 to 1000 pounds of quicklime per acre is sufficient.

Section II, 1000 to 2000 pounds of quicklime per acre on hills and half as much in valleys.

Section III, 2000 to 4000 pounds of quicklime per acre on hills and half as much in valleys.

Section IV is very irregular. Many local areas and most of the valleys have sufficient lime, but hills in general will require about the same amount as do sections II and III

of limestone pebbles or stones ordinarily indicates sufficient lime, while the absence of limestone pebbles usually, but not always, indicates the need of lime.

When lime is required, in section I generally from 500 to 1000 pounds of quicklime per acre will be sufficient, or twice this amount of ground lime-

stone. In section II, from 1000 to 2000 pounds of quicklime per acre, or twice this amount of ground limestone, will usually be sufficient. In section III the soil is generally very deficient in lime, and from 2000 to 4000 pounds of quicklime per acre, one-half as much more of hydrated lime, or twice as much ground limestone, is required. The land in section IV is very irregular. Many of the valleys are supplied with lime, but most of the hill lands require about the same amount per acre as do sections II and III.

There are certain areas in the State, such as the limestone soils, where most of the productive soils will grow alfalfa. However, for a large section of the State, designated as section III on the chart, only the best land should be used for alfalfa at first. Its culture should be tried first on well-drained bottom land and extended to upland as experience is

FIG. 149.— *Root nodules of alfalfa*

gained and as experiment indicates the best method of procedure. On the hardpan soils of southern New York, alfalfa culture should be tried only on the most favorable land at present.

Forms of lime.— There are three forms of lime. When 100 pounds of pure raw lime rock is burned, it is reduced to 56 pounds, because certain gases are driven off. When this burnt lime, or quicklime, is water-slaked, it takes up 18 pounds of water, giving a weight of 74 pounds. Therefore, the amount of each form of lime, if pure, to give equivalent results is expressed as follows:

Burnt lime, or quicklime	56 pounds
Hydrated lime	74 pounds
Ground limestone	100 pounds

INOCULATION FOR ALFALFA

Alfalfa requires large amounts of nitrogen. If the soil is very rich in easily available nitrogen, the alfalfa plants will acquire a sufficient amount

for good growth. In ordinary soils, however, alfalfa is not able to obtain its nitrogen from the soil, but must have the aid of certain bacteria that fix free nitrogen from the air in such form that it can be utilized by the plant.

Root nodules are found abundantly on the roots during most of the growing season. These nodules are the home of the bacteria that have the power of assimilating free nitrogen from the air in the soil, fixing it in the nodules, and passing it on to the alfalfa plant.

Where alfalfa has never been grown, the bacteria are probably not present, unless sweet clover is found growing. The proper bacteria may be present in soil to which sweet clover is native; in fact, its presence usually indicates a good alfalfa soil. In the absence of sweet clover, bacteria must be introduced artificially. A good method of inoculation is to procure soil from an old alfalfa field and to apply it at the rate of from 200 to 300 pounds per acre to the new field just before sowing. The soil should not be allowed to dry before applying. As sweet clover has the same form of bacteria, soil from an old sweet clover patch may also be used with success. An equally good method of inoculation is by means of cultures of the bacteria. There are many prepared cultures on the market, or they can be obtained in limited quantity without charge from the United States Department of Agriculture, Washington, D. C. This College sends cultures to residents of New York State at cost; the charge at present is 25 cents for enough of the culture to inoculate an acre. Persons should address Laboratory of Plant Physiology, College of Agriculture, Ithaca, New York.

Inoculation is not necessary in limestone soils where alfalfa has been cultivated in the neighborhood for many years. Under such conditions the proper bacteria for effecting inoculation seem to be present. Also on very fertile, heavily manured soils alfalfa will often live without inoculation for two or more seasons, when natural inoculation often seems to take place.

Manuring the land before plowing for alfalfa is a great help, especially in soils on which liming and inoculation are necessary. The manure not only furnishes a needed stimulus to the young alfalfa, but, what is more important, it helps to make the soil favorable for the rapid development and spread of the alfalfa bacteria.

SOWING THE SEED

Amount of seed

Twenty pounds per acre is the usual rate of seeding. On good alfalfa land a satisfactory stand sometimes results with from 12 to 15 pounds, but with 20 pounds the stand obtained is oftener too thin than too thick.

Time of seeding

There are three general times of seeding, early spring (April), late spring (June), and midsummer (August). When the soil is suitable, midsummer seeding is probably preferred by the majority of growers, as it not only enables them to secure some other crop from the land the same year, but does away with the necessity of clipping in order to keep down weeds and with general care of the crop for the first year. The

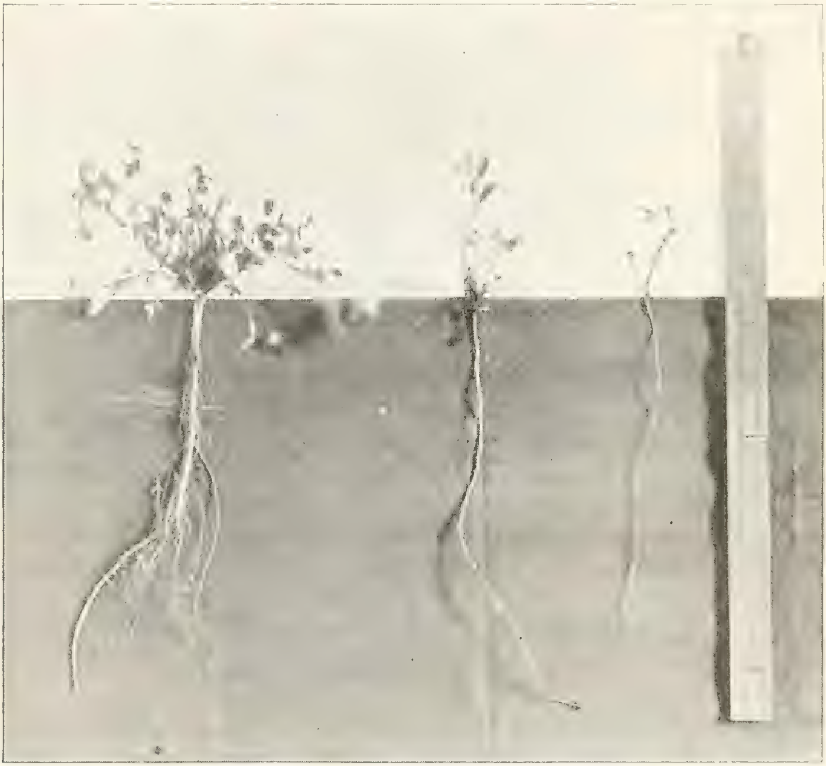


FIG. 150.— *Showing advantage of midsummer sowing, as compared with early fall sowing. Beginning at the left of the picture, the seed was sown August 19, September 15, and October 1, respectively. All were dug up April 13 of the following spring. (At Nebraska Agricultural Experiment Station)*

commonest cause of failure in spring-sown alfalfa is weeds; but these seldom give trouble in midsummer seeding, as the summer weed crop has practically been destroyed by that time. Midsummer seeding should be from July 25 to August 10, and never later than August 15. The soil should be in good preparation and thoroughly packed, as alfalfa will not winter well in a loose seed-bed.

The two principal objections to midsummer seeding are: (1) the season may be too dry to prepare the land and sow the seed by August 10; (2) on heavy soils or those with hardpan subsoil the young plants are not strong enough to withstand winterkilling. There is a large area of such heavy soil in New York State, especially the type known as Volusia silt loam and the hardpan hill lands in the south-central part of the State.

For the heavy types of soil mentioned above, the land should be thoroughly prepared and sowed about May 1; or, if the land is weedy and not in first-class tilth, it should be plowed early and fallowed for about two months, killing the spring crop of weeds and putting the soil in fine tilth. Sowing should be done about June 1 to 10.


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FIG. 151.— *Hogs in alfalfa pasture. Not troubled about the high cost of living*

A nurse crop is seldom used except on land especially well adapted to alfalfa. In the latter case in New York, it is generally sown either with oats in the spring or on fall wheat in the spring in the same way as clover. The young plants are delicate and must be favored in early growth. However, in spring sowing it is often good practice to sow a half-seeding (one bushel per acre) of oats or barley to be cut green at heading time for hay.

Method of sowing

Drilling is a good practice, but the land must be harrowed smooth after the drill. If the drill marks are left, a heavy rain within six or eight weeks after sowing may wash enough soil on the young plants to kill them. Broadcasting ahead of a disk drill or a spring-tooth harrow and rolling afterward is very satisfactory.

CARE OF THE STAND

If the alfalfa is spring- or summer-sown without a nurse crop, the weeds must not be allowed to get ahead of the seeding. They should be clipped back with a mower, the cutter bar being set from five to six inches high. It is important not to clip the young alfalfa close to the ground, below the leaves, during the first four months, as good stands are often killed by so doing.

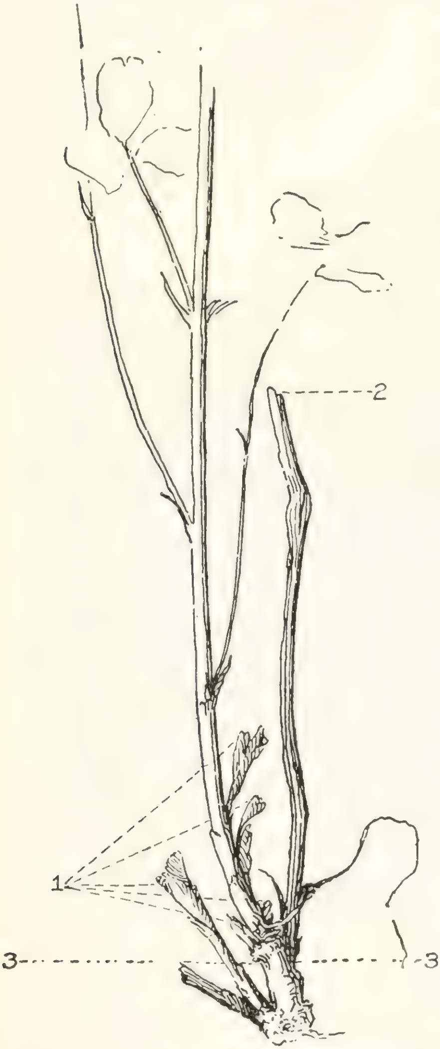

FIG. 152.— *Portion of alfalfa stem showing new shoots, natural size: 1, new shoots; 2, old stem showing height at which previous crop was cut; 3, soil line. Alfalfa should not be cut before the new shoots appear, and the mowing should be completed before the shoots get tall enough to be clipped*

The established field

Alfalfa should be cut when the new growth that starts up from the base of the plant as it nears maturity, is from one to three inches high. If the new growth is allowed to become longer than this, there is danger of injuring the next crop when cutting the present one. At this time usually not more than one-tenth of the plants should be in bloom. The most successful alfalfa growers judge the time of cutting by the shoots at the base of the plant rather than by the bloom. It is not safe to judge by the blooming alone, for alfalfa often fails to bloom when the season is cool or wet.

Disking the alfalfa field early in the spring or after the first cutting is often practiced in dry climates, but in humid climates, such as that of New York, the plants injured by the disk are very likely to develop root rot and thus, on the whole, decrease the stand in time. However, on an old stand that is thin and must be broken up in another year, disking will stimulate growth for at least one season and destroy many of the weeds and much of the

grass that may be coming in. Therefore disking is good practice under such conditions, but it is not good practice on a new stand. It is reported

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FIG. 153.— *Curing alfalfa under hay caps. It is wise to have enough hay caps for a part of the crop*

that thorough harrowing with a spring-tooth and a peg-tooth harrow in the early spring and after the first cutting will control weeds and grass,

FIG. 154.— *Baling alfalfa from the windrow in the field. A practical method in good haying weather*

the latter especially often gives much trouble in alfalfa fields. This harrowing will not injure the alfalfa if done before the growth is far advanced.

Pasturing

Alfalfa is the ideal pasture for hogs and horses, but if cattle are pastured on it, they are likely to bloat. For cattle pasture alfalfa should be mixed with grass, about half and half. It is important not to pasture close, as a good stand may be killed in a single season by close cropping. Ordinarily, enough forage should be on the land at any time to cut at least three-fourths of a ton of hay per acre. The best practice is to cut for hay about twice a season while pasturing. Treated in this way the stand will last for from ten to twenty years.

CARE OF THE HAY

Two points are to be remembered: first, that alfalfa hay cut young — when one-tenth in bloom — is more digestible and better than when older; second, that the leaves of alfalfa are from three to four times as valuable as the stems. Good alfalfa hay should be about one-half leaves, but unless handled with care a large proportion of the leaves may be lost.

How to cure

The first crop, which is usually harvested the middle of June, is handled very much as a heavy clover crop. The first crop is generally heavy, and the stems are coarse; this crop is not easy to cure. Coming at a time when haying weather is not the best, the first crop is usually cured in small cocks. The second and third crops, being lighter, with finer stems, and coming in July and late August when haying weather is good, are easily cured. The second and third crops are often cured in windrows and stacked or put in the mow directly, without cocking.

FIG. 155.— *Alfalfa seeds below, compared with dodder seeds above (enlarged)*

FERTILIZER AND MANURE FOR OLD SODS

No crop responds more readily to barnyard manure than does alfalfa. Whenever an established stand is not doing well — yielding less than three tons per acre — it will pay to manure. The manure should be applied during the winter.

Many successful alfalfa growers have used from 200 to 300 pounds of acid phosphate per acre with very good results. It is worthy of careful trial.

ALFALFA SEED GROWING

Usually the second crop, and sometimes the third, is used for seed. Dry weather is required during the blooming period to secure a set of alfalfa seed, and July is the month when the proper weather conditions are most likely to occur. In New York, however, it is seldom that a good seed crop can be secured, and it is not to be expected oftener than once in three or four years. The seed is harvested very much as is clover seed; as soon as the alfalfa is cured, it is threshed, either from the field or from the stack.

FIG. 156.—*Alfalfa dodder, showing its habit of growth*

ALFALFA ENEMIES

Dodder

The effect of dodder in alfalfa fields is shown by the appearance of dead areas near the margin of which is a tangled mass of slender yellowish cords entwined about the alfalfa plants. Infested spots should be closely mowed, the stubble sprinkled with kerosene, covered with dry hay, and burned. Seed free from dodder should be used. Samples of seed may be sent to the Geneva Experiment Station for examination. A 20x20 mesh sieve made of No. 34 wire will remove the dodder from alfalfa seed, if care is taken to screen a small amount of seed at a time.

Leaf spot

Leaf spot causes the leaves to become spotted and yellow, and to fall prematurely. Affected fields should be mowed early in order to save as

much of the foliage as possible. The succeeding growth is usually uninjured by the disease.

EXPERIMENT TO DETERMINE WHAT A GIVEN SOIL REQUIRES FOR GROWING ALFALFA

Every farmer who plans to grow alfalfa extensively at some future time may determine for himself the needs of his soil by a very simple experiment. In fact, it would not be advisable to undertake alfalfa culture extensively in a region where it had not been cultivated previously, without first experimenting. The plan of the experiment is as follows:

Lay off a plat of land eight rods long and four rods wide and divide it into eight square plats of one-fortieth acre each, as shown in the plan, setting stakes at the corner of each plat. Great care should be taken to see that the soil is uniform in quality.

1 Inoculated Lime	2 Inoculated Lime Manure	3 Inoculated Manure	4 Inoculated
5 Lime	6 Lime Manure	7 Manure	8

Apply 56 pounds of quicklime or 100 pounds of ground limestone to each of plats 1, 2, 5, and 6; a liberal dressing of barnyard manure to each of plats 2, 3, 6, and 7; 20 pounds of fresh soil from an old alfalfa field or sweet clover patch to each of plats 1, 2, 3, and 4. No treatment should be given plat 8.

This experiment furnishes all possible combinations of lime, manure, and inoculation, with a check plat of untreated soil. Particular care should be exercised in choosing ground free from weeds and in putting it in good tilth before sowing. The land should be plowed from four to eight weeks before seeding and the lime applied at that time. The inoculation should be done at sowing time.

The experiment should be allowed to stand at least two years, as the most marked effect of the treatment is to be expected the second year.

REFERENCES

The book of alfalfa. F. D. Coburn.
Alfalfa in America. Joseph E. Wing.
Alfalfa. Farmers' Bulletin 339, U. S. Department of Agriculture.

THE CORNELL READING COURSE FOR THE FARM

This College offers to those who desire to learn but are unable to leave their work, a course of reading on the principles and the practices of successful farming. The course is conducted by means of lessons specially prepared for the farmer who desires to keep in touch with the latest information available, and to understand the *why* as well as the *how* of farming. The aim of the reading course is to provide consecutive agricultural information in the form most satisfactory to the busy farmer. Practical subjects are treated, and each reader may register for those of particular interest. The lessons are made as clear, interesting, and much to the point, as possible. Direction is given to the reading by the arrangement of the lessons in series and by sending the lessons in each series consecutively.

On registering for one or more subjects, the reader receives the first lesson in each series. The lesson furnishes the text for reading and is accompanied by a supplement called a discussion paper. The discussion paper serves three purposes: First, by returning the discussion paper the reader acknowledges the receipt of the lesson and indicates his interest. As soon as the discussion paper is returned to the College, a second lesson in the series is sent. This method is continued until the reader has completed the study of all the subjects in which he is interested. Second, the discussion paper furnishes questions to encourage thought and self-expression by those who wish to make a careful study of the lessons. Answering the questions therefore is optional, but in order to continue to receive the lessons by series it is necessary to sign and return the discussion papers. Third, the discussion paper furnishes a ready means of inquiring for information on any agricultural subject. Requests for information are referred to specialists for a personal reply.

One new lesson is added to the reading course for the farm each month, being placed in the appropriate series. Such new lessons as are of general interest are sent to all the members of the course as soon as issued. Readers who have completed a study of all of the series in which they are interested will continue to receive new lessons. Two advanced reading courses are offered especially for those who have completed a study of reading course

lessons. References for advanced study in subjects not treated in the advanced reading courses will be given on request.

By means of reading course lessons study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs by the supervisor of the reading course for the farm.

Residents of New York State may register in the reading course for the farm free of charge, but the course is not available to nonresidents either free or in return for a cash payment. A limited number of particular lessons, however, will be sent free to any one on request. Residents of New York State are invited to register for one or more of the following subjects: the soil, poultry, rural engineering, farm forestry, the horse, dairying, fruit growing, farm crops, stock feeding, vegetable gardening, plant breeding, insect, country life. Address Reading Course for the Farm, College of Agriculture, Ithaca, New York.

SUPPLEMENT TO

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Entered as second-class matter at the post office at Ithaca, New York

VOL. IV. No. 90 JUNE 15, 1915 FARM CROPS SERIES No. 1 revised

ALFALFA FOR NEW YORK

DISCUSSION PAPER

A discussion paper is sent with each reading course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully, and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, INSECT, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, the reader should sign and return this discussion paper, whether the questions are answered or not.* By means of reading course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading course work, and also for names and addresses of residents of New York State likely to become interested in the Cornell Reading Course for the Farm.*

(*In answering questions, attach additional paper if needed and number the answers*).

1. Have hardy varieties of alfalfa been tried in your vicinity, and if so, with what success?

2. In what respect does your soil vary from ideal alfalfa soil? Is it too heavy? too light? hardpan? acid? or does it lack drainage?

3. Name the three most important soil treatments generally required in preparing land for alfalfa.

4. What is the probable lime requirement per acre of land in your vicinity?

5. What month is regarded as the best time for sowing alfalfa in your county? Is it generally sown with a nurse crop, or without?

6. From inquiry do you find that new seedings of late-sown alfalfa winterkill on soil similar to that of your farm? Do old, well-established stands winterkill?

7. At present prices would it pay you to grow alfalfa rather than timothy? What yield per acre do you expect from each crop?

8. Capitalizing the net income from alfalfa, on what value per acre would alfalfa meadow pay an income of six per cent?

9. How much per acre would you feel justified in spending in order to secure a good alfalfa stand?

Name..

Address..

Date..

(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)

The Cornell Reading Courses

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Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

VOL. IV. No. 92 | JULY 15, 1915 | VEGETABLE GARDENING SERIES No. 4

SUMMER CARE OF THE HOME VEGETABLE GARDEN

ALBERT E. WILKINSON

The gardener may make careful plans for his garden, select the best site, order the most viable seeds, plant or transplant at the proper time, and yet fail of success if he does not give proper care and attention to the plants during the growing season. This lesson discusses some of the details of

FIG. 157.—*A garden in midsummer. While this is a town garden it illustrates the fundamental principles, which are applicable in town and country alike. This garden* [illegible] *made to be photographed, but it shows complete utilization of space, succession of crops, large variety, attractive arrangement, and good care. Note the line and the berry baskets where a row of tiny lettuce plants has just been set. Even in the country a small garden like this one is better than a half acre gone wild*

summer management that are important in bringing the vegetables to a successful harvest.

CULTIVATION

Cultivation is the stirring of the surface soil so that weeds will be eradicated and evaporation of water from the soil will be checked. This is the fundamental operation in a garden during the summer, for unless

evaporation of moisture from the soil is hindered, all vegetation will suffer.[1] The purposes of cultivation are several and differ slightly from those of earlier soil working, generally called tillage. These purposes are as follows:

1. Conservation of soil moisture. The maintenance of a dust mulch over the entire surface of the soil will effectively prevent excessive loss of moisture and will also offer conditions that are favorable for the entrance of rains.

2. Aeration. If proper cultivation is given, the roots of the plants are permitted much freer access to the air, which is essential to their development.

3. Modification of the soil temperature. The maintenance beneath the surface mulch of a suitable amount of moisture tends to prevent wide fluctuations in soil temperature.

4. Improved physical condition. The improvement is due to loosening of the soil, retention of the water, and aeration.

5. Increased action by bacteria. This results from the improved physical condition of the soil. Decomposition of plant-foods is hastened, thus rendering them readily available.

6. Prevention of erosion. With a good surface mulch the soil is enabled to take up a larger amount of water than is possible if the surface is not stirred. This prevents to a considerable extent the loss of soil particles, humus, and valuable plant-food.

7. Weed eradication. Weeds rob the soil of its moisture and plant-food, thus removing essentials from cultivated plants. Above ground weeds produce such strong growth that they tend to shade the useful plant. A plant robbed below ground and above ground is soon dwarfed and of very little value.

It is impossible to follow any fixed rules in regard to cultivating the garden; however, some suggestions are given here concerning the most advisable time. In general the correct time to cultivate is when the soil has dried slightly following a rain, although a very sandy soil may be worked when rather wet. If heavier soils, such as silt or clay, are cultivated when wet, puddling or the formation of hard clods results. Such soils will work up more easily and better when they are dry enough to crumble. In case the soil becomes hard, or a crust is formed before rain comes, the surface soils should be worked in order to prevent evaporation of moisture. Many good gardeners cultivate every week or ten days, thus assuring the maintenance of a soil mulch and killing the weeds when they are small and more easily kept in check. It is impossible to injure garden plants by over-much timely and thorough cultivation.

[1]Soil moisture and crop production. By Elmer O. Fippin. Cornell reading course for the farm, Vol. III, No. 70.

In order to obtain the best results, cultivation should begin just as soon as the seeds are sown or the plants transplanted. Since practically all vegetables are shallow rooted, they should be cultivated from one-half to one inch deep. Some gardeners cultivate deeply at first, from two to three inches, and, as the crop grows, gradually decrease the depth. Other gardeners cultivate deeply, at first the entire width between rows, but gradually limit the area of deep cultivation to the center of the space

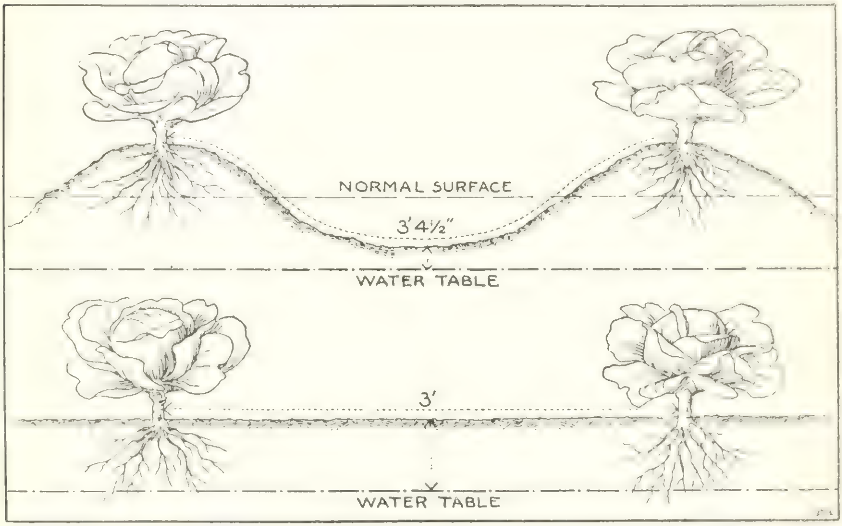

Fig. 158.—*Level culture is preferred nowadays*

between rows as the plants increase in size. As a rule, deep cultivation is to be discouraged; it is nothing more than tilling poorly prepared land. The soil should be properly prepared before the garden is planted; then there will be no excuse for deep cultivation.

Conservation of moisture is easier and more efficient where level cultivation is practiced because the exposed surface of the soil is not so great as when the plants are hilled (Fig. 158). To make hills requires more labor, which in turn costs more in money or effort. There is also a loss caused by severing the roots of the plant. The last point is of great importance if the gardener has not plowed the soil deeper than from four to five inches, because hilling will rob the roots of their feeding ground.

TOOLS FOR CULTIVATION

There is a great variety of tools adaptable to the work of cultivating gardens. Efficiency depends in a larger measure on the character of the tools selected and on the skill of the operator in managing them. A gar-

dener who does not thoroughly understand the use of any particular tool, should exercise considerable care until proficient. In the farmer's home garden and in other gardens of large size, it might be well to use horse-drawn tools.

Horse cultivators are of two general types: those having large, flat teeth, commonly called shovel-tooth cultivators; and those with narrow teeth, called spike-tooth cultivators. The latter are generally preferable for use in gardens, because they do not work deeply, can be operated much

FIG. 159.— *One horse spike-tooth cultivator*

closer to the plant, and are lighter and therefore easier to handle. The shovel-tooth type includes coarse, deep-working tools of five or seven teeth; these are not adaptable to the intensive work of the average large home garden. The cost of a one-horse cultivator varies from five dollars to ten dollars.

Many home gardeners are doing away with the horse-drawn cultivators entirely, preferring to decrease the size of their gardens, intensify their operations, and use man-power wheel cultivators. There are several types of these machines; figure 160 illustrates some of them. All of these tools are shallow working, adaptable to very close culture, easily operated, and highly efficient. The cost varies from four dollars to fourteen dollars and fifty cents. Many of the wheel cultivators have several types of attachments, such as rake, harrow, hoe, shovel, or disk, while others have

Fig. 160.— *Several forms of wheel hoes*

but one. Any one wishing to buy these tools should inspect those at the local stores or should write to the manufacturers for catalogues. With these tools not only can much shallower cultivation be practiced than with horse-drawn cultivators, but it is possible to cultivate much closer to the plants, in many cases doing away largely with hand hoeing or finger weeding. The one-wheel hoes are pushed between rows, and the two-wheel may be used similarly to the one-wheel, but are generally pushed straddling the row. In order to work these machines efficiently, a knack is required, which is gained only with practice. These hoes are light and easily operated.

Fig. 161.— *The two-wheel tool permits close cultivation on both sides of the row*

Thrust, or scuffle, hoes and drag cultivators are modifications of

wheel hoes; both types have proved highly efficient. Scuffle hoes represent the older type of hand cultivators and cost from fifty cents to one dollar, depending on the width of the blade. Drag cultivators cost from fifty to seventy-five cents, according to the number of prongs.

Where the soil in the row is not stirred by tools of the types mentioned, it is necessary to use hoes or weeders. There are many types of hand hoes: those with the blades nearly square, as the common field hoes; those with blades wider than they are deep, as the market garden hoes; onion hoes, which are light and narrow bladed; field hoes with round teeth cut in the base of the blade; those with long teeth; those with heart-shaped blades; and many others. Each of these types has some special advantage or adaptability: for example, the heart-shaped hoe is used as a furrow opener, those with round teeth and those with long teeth for fining the soil where very shallow cultivation is desired, and the market garden and the field hoes for killing weeds, as well as for mulching. The hoe that has a blade on one side and single or double prongs on the other, is valuable for both

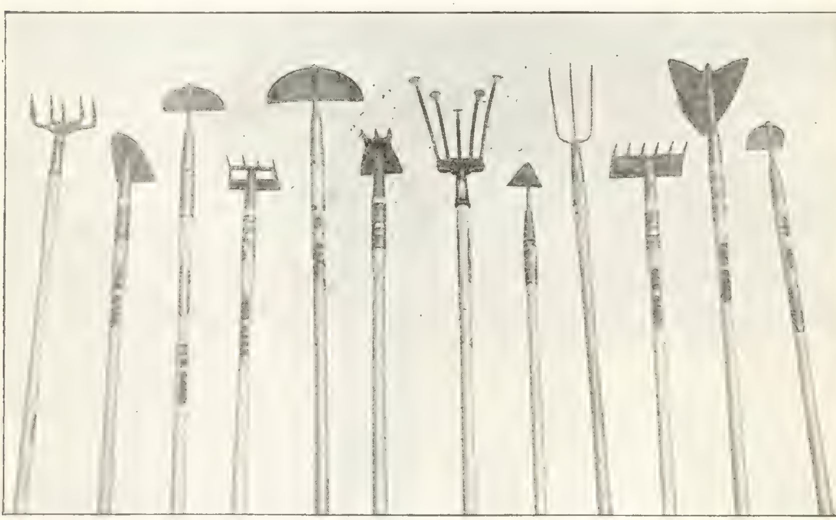

FIG. 162.— *Hoes for stirring the soil. Different ones are good for different soils and different crops*

close and ordinary work. All these hoes should be used for about the same purpose, that is, to stir a shallow layer of the topsoil and to kill the weeds.

Hand weeders are as numerous in design as hoes, such types as the rake, the knife, or the hook being common. They are operated very close to the plants and are used generally in thinning thick stands of plants,

such as onions, beets, or carrots. The main work of weeders is to supplement the previously mentioned tools by establishing a surface mulch and eradicating weeds in the rows. Weeders may be bought for from ten to fifty cents, or they may be made at home from other old tools.

FIG. 163.— *Tools used for weeding and transplanting*

MULCHING

Probably the reader is familiar with the practice of mulching strawberries with straw, manure, or other material. Possibly he has read of the practice of mulching other fruits, such as the gooseberry, the currant, the raspberry, and the blackberry. Some gardeners have concluded that if mulching is good for these fruits, it would also be good for vegetables, and trial has proved that this supposition is correct. Many times instead of cultivating the ground the gardener may effectively mulch it with various materials, and, to a large extent, obtain the same results as by cultivation. The principal purposes of mulching are as follows:

1. To conserve moisture. The layer of mulch, being dry on top, to a large measure checks the influence of sun and air on the soil moisture. The mulch also prevents the soil from baking and cracking, which result in increased loss of moisture.

2. To check weed growth.

3. To keep the surface soil loose and friable. The force of beating rains is broken by passing through the mulch, which thus prevents the packing of the soil.

4. To supply plant-food. When manure is used, the rain dissolves some of the material contained in it, and thus plant-food is added to the soil.

5. To save labor at a busy time. The manure or other material may be applied during a slack time, and, as it does away with cultivation, the busy farmer is free during the rush of haying and subsequent catching up of work that has been neglected.

The materials used for mulching are generally manure, straw, leaves, lawn clippings, or moss. Excelsior, sawdust, and shavings are of less value, for the woody matter may be a detriment, especially when turned under year after year in large amounts. If manure is used, it should be applied at least two to four inches thick, having the thickest part of the layer in the center of the row. It is advisable not to have the manure against the plant because of possible injury or discoloration. Leaves or straw should be used in the same way.

FIG. 164.— *Mulching with manure*

From tests carried on at different experiment stations, it has been found that by mulching asparagus, rhubarb, cabbage, tomatoes, beans, cucumbers, celery, and potatoes, the yields have been greatly increased; diseases have been less prevalent; the vegetables have been larger; and in some cases the quality of the product has been much improved. It has been found advisable, however, not to mulch lettuce, radishes, spinach, and a few other quick maturing crops because of the short time before the crop is harvested. In the case of lettuce or crops of a similiar nature, the mulch injures the leaves by becoming entangled with them, and sometimes by causing discoloration.

SUMMER APPLICATIONS OF MANURE AND FERTILIZER

Celery, lettuce, chard, corn, tomatoes, and a few other vegetables are often benefited by application of food during the growing season. Oftentimes a side dressing of fertilizers or manures is used to hasten the growth of the plants and thus to obtain early maturity. The different materials that are so used are hen manure, nitrate of soda, fish scrap, dried blood, tankage, and liquid manure. In some particular cases a complete ferti-

lizer containing the three most important plant-foods, nitrogen, phosphoric acid, and potash, may be used. These materials are strewn sparingly along the rows of the crops. It is highly important when using hen manure, nitrate of soda, or chemicals of any sort, not to distribute them too thickly because injury to the foliage or the roots may result. Sometimes gardeners have obtained good results by using the following method with such crops as celery and cabbage: A shallow furrow is opened rather close to the plants, and from one hundred to one hundred and fifty pounds of nitrate of soda an acre or twice that amount of hen manure, is placed in it, and the furrow filled.

Sometimes during the development of a crop of vegetables, the gardener notices that the plants are dwarfed, that the color, instead of being dark green, is light green, or that other indications of checked growth are apparent. At times the difficulty may be traced to disease or insects, at other times, to poor soil preparation, lack of cultivation, and sometimes to deficient food supply. In the latter case, it is possible to overcome the difficulty by applying fertilizers or manures as a side dressing. An old time remedy, which was in general use in many gardens a few years ago and is used somewhat at present, is liquid manure. The method of making this liquid fertilizer is as follows: Place a bushel of cow manure in a barrel of water, and allow half a day or more to elapse before using the clear liquid, which should be diluted until it has the color of weak coffee. From one to two quarts may be poured on the soil around the plant.

As a general rule it is best to avoid the necessity of side dressing by applying a sufficient quantity of plant-food before the garden is planted.

IRRIGATION

As a protection against drought, many gardeners are taking steps to supplement the natural water supply. Cultivation helps to conserve the moisture that is in the soil or that falls on the soil, but cultivation cannot add water directly. In New York the opportunities for irrigation are abundant because the State is plentifully supplied with rivers, lakes, creeks, brooks, and other sources of supply. Ordinarily water can be obtained at very low cost. Home gardeners living in cities or towns have the advantage of the public water systems, and their irrigation problem is therefore very simple of solution.

There are several methods of irrigation in gardens, one of the common being the hose method. The cost of installation is rather heavy, as the hose costs from eight to twenty cents a linear foot. Initial cost and depreciation may be reduced by laying a permanent pipe through a garden and using short lengths of hose, which may be attached at any one of the

several points. The wear and tear on the hose is also serious, soon necessitating a new outfit. Another considerable drawback is the long time required to satisfactorily water a garden. Many gardeners, in using a hose, do more harm than good. They spend from half an hour to an hour in watering a garden of considerable size, when in reality they have only moistened the top layer, leaving a layer of dry soil between this top layer and the lower body of moist soil. The surface soon dries out, and the labor, the wear on hose, and the water are wasted.

Another method of irrigation is the furrow method, which requires a supply of water led to the highest point in the garden, through a pipe, a spout, or an open ditch. From the main source lateral furrows or ditches are constructed, preferably between every other row in the garden. The water is then allowed to run through these furrows whenever required during dry periods. As soon after watering as conditions permit, the soil should be cultivated in order to conserve the moisture. The furrow system has the advantage of being cheaply and easily installed, but it is wasteful of water. This method is of very little value where the land is uneven in contour or where the land is absolutely level. It works best where the garden slopes gradually away from one point. Where soils are very porous or very hard, the furrow system is not successful.

Subirrigation is accomplished by means of tile that are laid below ground. The general system consists of a main from four to ten inches in diameter from which extend laterals three or four inches in diameter. The subsoil should not be open and porous, or loss from percolation will result. The best results from the use of this method of irrigation are obtained where hardpan is found two or three feet below the surface and where the topsoil is a rich sandy loam full of humus-making materials. There are many advantages in subirrigation. All of the parts of the system are below ground so that there is nothing to interfere with plowing, harrowing, and other labor on the soil. The surface of the soil is never wet as a direct result of irrigation, making it possible to till it at any time. There is no baking of the soil, and if a good mulch has been established, it can be maintained with less labor. The drawbacks of this method of irrigation are found in the cost of installation, and in the very slow movement of the water from the laterals through the soil.

The fourth method of irrigation is the overhead system, which aims to imitate a light rainfall. This method is now much used in commercial gardens in New York State in preference to others. There are several different firms that handle equipment for this method. The chief advantage of this plan lies in the even distribution of water with very little attention. Where the home gardener has water under pressure, it will be possible to install the overhead system. The cost of a line fifty feet

long for overhead irrigation is $9.75, f.o.b., and of a line one hundred feet long, $18.85. The shorter line will water a garden fifty feet by fifty feet, and the longer, a garden one hundred feet by fifty feet. An outfit consists of fifty or one hundred feet of galvanized pipe all drilled and cleaned so that the nozzles can be inserted, the full number of nozzles needed, one valve or gate to control the water supply, one specially constructed turning union, three roller-bearing pipe supports to be placed on top of posts, and one drain cock inserted at the end of the line for draining. The purchaser has to furnish the feed line or connection with the water supply and four posts for supporting the pipe line. The system is entirely portable and may be taken down during the winter. The amount of pressure needed for good results is thirty-five pounds, and some gardeners report that better results are obtained by using as much as sixty pounds.

FIG. 165.—*A rain machine, overhead irrigation*

TRAINING

Garden space may be economized and products of a finer quality may be obtained from many vegetable plants if they are supported from the ground by staking or training. The gardener is enabled to cultivate, to spray, and to do other work in the garden more easily and more thoroughly, while the products are kept free from dirt. Tomatoes, pole beans, tall-growing peas, cucumbers, squashes, and melons lend themselves particularly well to this method of culture.

Training and staking are especially advantageous with the tomato, as the sun is thus enabled to reach the fruit, and ripening is hastened. There seems to be less trouble from certain diseases, particularly blossom-end rot, when tomatoes are grown in this way, though drought and lack of cultivation increase loss from this disease. For this plant a single stake driven on the north side of the stalk is ordinarily used. The plant should be tied to this stake every twelve inches, beginning about four inches from the ground. Tomatoes may also be trained on wires that are fastened

about six inches apart on posts set about fifteen feet apart in the row. Poultry wire may be used in the same way. Still another plan involves the use of two stakes driven into the ground about eighteen inches apart and carrying hoops encircling the plant at every twelve inches.

Pole beans may be wound about poles nine feet tall, to which they will hold tightly. Beans may also be grown on a trellis made as follows: Place a post at each end of the row. Stretch one wire nine inches from the ground between the two posts and another near the top of the posts. Between these wires weave strings, V- or X-fashion. The beans should be encouraged to

FIG. 166.— *Training tomatoes to a single stem*

climb up these strings. In place of the two methods chicken wire may be used, especially the five- or six-foot widths.

Peas may be held up with brush, or they may be supported by the aid of wires or poultry netting. Melons, squashes, and cucumbers may be trained to grow over a trellis made of wood, perhaps A-shaped or perhaps overhead. They may be trained on wires similarly to tomatoes or in other ways.

PRUNING

In many cases it is an advantage to prune vegetable plants, especially if they are to be trained or staked. Some growers pinch back tomatoes by taking out all the lateral growths that are found at the bases of the

leaves. The tomato plant must then grow to one stem. Sometimes two or three stems are desired, in which case all lateral growths but the required number are removed. With the cucumber it is often advisable where the plants are too thick, to remove some of the lateral shoots or even to remove the tip. If the plant tends to produce an overabundance of leaf growth, it may be pinched back in order to encourage the growth of fruit. A stockier and more vigorous growth may be encouraged in melons in the same way. Occasionally in the home garden one desires to obtain but one melon or one squash from a particular plant. In such cases all female blossoms are removed after one fruit has been set, and the vegetative growth is kept within bounds by judicious pruning. Thus the energy of the plant is centered in the development of the single specimen.

BLANCHING

In order to obtain the highest quality in certain plants, it is necessary to shut out the sunlight. This process is known as blanching. It prevents the formation of coloring matter in the stem or the leaves, and at the same time stops the function of food making. A blanched plant will soon decay if kept too warm or too moist.

White asparagus is generally obtained by cutting shoots before they extend far above the ground, though some varieties are naturally whiter than others. A mound is generally thrown up over the asparagus crowns, and the shoots push up through the soil until they reach the surface of the ground. Asparagus grown by the blanching method generally has a shorter stalk than the green asparagus, and in some cases only the tips are cut.

Endive is blanched by gathering and tying the leaves above the center of the plant. The heart of the plant, shut in from exposure to sunlight, loses its natural green color, and turns yellowish white. Endive is less bitter when blanched. Sometimes it is necessary to blanch lettuce in a similar manner, especially lettuce that has a tendency to be loose headed, such as the cos or the romaine types.

Celery has a bitter flavor and dark color if not properly blanched. Well-blanched stalks vary in color from chalk-white to golden yellow according to the variety. Celery blanching may begin from two to four weeks previous to harvesting, according to the season. Early blanching may be accomplished by placing boards along the sides of the rows about six inches apart at the bottom and about two to three inches at the top. The soil should be pressed slightly against the base of the boards, and the top should be firmly held by means of a strip of wood or by a wire spanner. The boards should be from ten to twelve inches wide or more if tall celery is grown. Roofing paper or red siding of the same

width may be substituted for the boards and may be held in place by a U-shaped arch, which is pushed into the soil (Fig. 167). On a small scale, tile or cylinders of paper may be used (Fig. 168). These may be slipped over the plant and a small amount of soil pressed up around the base in order to shut out all sunlight.

FIG. 167.— *Blanching celery with paper. Boards may be similarly used*

FIG. 168.— *Blanching celery with a tile. A paper cylinder may be used in the same way*

Earth is generally used for blanching late celery. The soil is first brought around the plants, in a ridge about three inches high; four or five days later it is pushed up about an inch higher; in another four or five days it is pushed still higher; and so on until it covers very nearly all of the celery. It is important not to get the dirt inside of the celery hearts. The celery should be inspected very carefully for rust, for it is not advisable to blanch with dirt if rust is present. If the celery is to be stored and used during January, February, or March, one week of shading by means of low banking, about six to nine inches high, will start the blanching just enough. Celery will keep better and longer if in a green condition.

The flowering head of cauliflower to be of good quality must be carefully protected from sunlight; otherwise it will be of dark color and poor flavor. Some varieties are almost self-blanching, but it is nearly always necessary to tie the leaves over the head soon after it begins to form. Some gardeners protect the small heads by covering them with paper.

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PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

VOL. IV. No. 92 JULY 15, 1915 VEGETABLE GARDENING SERIES No. 4

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A discussion paper is sent with each reading course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully, and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

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(In answering questions, attach additional paper if needed and number the answers.)

1. Describe instances where frequent cultivations in a garden have demonstrated their value.

2. Do you find wheel hoes especially useful? Discuss.

3. Have you compared level culture with hill culture? With what result?

4. What are the advantages of mulching?

5. Have you used the mulching method? What results have you obtained?

6. Do you irrigate your garden? If so, what is your method?

7. Is it better to water a garden frequently and lightly or less frequently and thoroughly?

8. What vegetables do you train, prune, or stake? Describe your methods.

9. Have you found training and staking especially helpful for tomatoes? Why?

10. Give in detail your methods of blanching vegetables.

Name..

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Date..

(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)

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VOL. IV. No. 94 | AUGUST 15, 1915 | COUNTRY LIFE SERIES No. 3

THE FARM FISHPOND

GEORGE C. EMBODY

American farmers have been flooded with reading matter designed to assist them in increasing the productivity of their land areas, but that which relates to the utilization of their aquatic resources is scanty.

FIG. 169.— *The harvest of the farm fishpond*

It is not surprising, therefore, that there are many springs and creeks unused, and that swamp lands incapable of drainage are considered of no value. It is possible to utilize these neglected resources for the propagation of fishes, frogs, and possibly many other useful aquatic organisms, which have a market value. In this way one may materially increase both the output of any farm possessing these resources and also at the same time the supply of a highly nutritious animal food.

Farm fish culture has been almost wholly neglected in America even though a large part of the country possesses exceptional advantages for it. Some interest was created years ago when the carp was introduced from Europe and rather generally distributed among farmers. Much of this interest died out, however, as it became known that the carp was not very well liked by Americans. The ponds were allowed to deteriorate, and, in the majority of cases, the stock carp were permitted to escape into public waters. Little effort has been made to interest people in propagating the better grade of native fishes, which are already in high esteem. This inactivity may perhaps be pardoned on the ground that until a few years ago one could go to the near-by stream or lake confident of obtaining enough fish or frogs for a meal.

An entirely different state of affairs prevails in certain parts of Europe; for example, in Germany, Austria, Switzerland, and Belgium, commercial fish culture is probably developed to its highest state. Farmers find it profitable to engage in fish culture, and, in the aggregate, immense areas of water are used for this purpose. Aquicultural experiment stations and schools, either connected with agricultural colleges or run exclusively in the interest of fish culture, teach the farmers economic methods of raising carp and other fishes. Carp is highly esteemed in Europe, and in the countries mentioned has a market value comparable to that of the better food fishes of America. Necessity no doubt has been the primary cause of the development of this industry. The supply of fish in the public waters of these countries was exhausted long ago, and, since sufficient meat could not be raised on land to fully supply the increasing demand, it became necessary to transform waste lands into water areas and to stock them with fish.

This bit of history is gradually repeating itself in this country. The largest fish-producing streams have been transformed into sewers; others have been dried up; and still others have been stripped of their inhabitants by too ardent harvesting. In order to justify the advance in the price of beef, dealers say that the supply is decreasing while the demand is becoming greater with the increase of the population. If this is true, either means must be devised for producing more beef, or other kinds of meat must be produced and utilized. There is much doubt as to whether the former will generally be possible in the State of New York, but the latter can be done by fish and frog culture. There are few farms that have not a stream, a spring, an artesian well, or a bit of swamp that could be developed into a profitable source of food supply.

During the past four years, the New York State College of Agriculture at Cornell University has been giving instruction in the propagation of useful aquatic animals to a steadily increasing number of students. Letters are continually coming in from persons in different parts of this and other

States seeking information concerning the propagation of frogs and fishes. For these reasons it is believed that if reliable information is widely distributed, the fishpond will soon become a common feature of the farm.

This lesson is written for the double purpose of answering many inquiries that come to the College and of stimulating a more general interest in farm fish culture. It is based on the practices in some of the government hatcheries and on experimentation undertaken in this College. It is wanting in many particulars principally because aquicultural investigators have not yet supplied complete and reliable information meeting farm conditions.

The pond herein described is not one that will put on its owner a great burden of labor, nor is it guaranteed to become a commercial success. It is designed merely to supply a good-sized family or two with enough fresh fish to satisfy their needs, and this with the least possible expenditure of labor. A commercial establishment would consist of many such ponds, and in order to make it a financial success, one would have to give it special treatment, which cannot be detailed here.

TYPES OF PONDS

There are in general three types of ponds depending on the method of construction: namely, the pond formed by damming a stream, the excavated pond, and the dike pond.

A pond of the first type is usually formed by throwing an embankment across the bed of a stream in some narrow part of its course. Notwithstanding its general popularity, a pond of this kind is a poor investment for three reasons. First, it can never be brought under complete control, for there is no sure way of preventing the escape of its inhabitants, especially the young fish. Second, every freshet brings in quantities of sediment, much of which is deposited on the bottom, and the accumulation of only a few years is necessary to materially decrease the depth. And third, the embankment, unless it be a very expensive one, is in danger during every freshet.

The ponds that are most likely to give profitable returns are either excavated below the surface of the surrounding ground or formed by building earthen embankments, or dikes. A combination of these two types is often desirable. In every case the pond should be situated away from the course of a stream and in such a manner as to preclude the possibility of surface water draining into it during the heavy rains.

LOCATION

Since every farm has its own particular conditions, only very general statements concerning the location of the pond are given. In a large

measure, it is determined by the topography of the land and the character of the water supply. Any fairly level acre of land situated slightly below a flowing spring or the water level in a creek, and at the same time a few feet above contiguous ground, constitutes an ideal location. From the water source to the lowest point on the farm there should be a total drop of at least seven feet; this will allow a gravity flow from the water source to the pond, and also from the bottom of the pond to some other point for draining.

While the ideally situated pond is one that can be completely drained by merely pulling a plug or by means of some other simple device, successful fishponds have been made in low-lying swamp or marsh land incapable of drainage and worthless from an agricultural standpoint. The soil removed in excavating such a pond often possesses high value as a fertilizer and may be used to advantage on upland fields. At any rate a pond is much more profitable than a mosquito-infested waste. The principal thing to be kept in mind in making a pond in such a location is the necessity for plenty of water during the summer months.

WATER SUPPLY

The water supply for a fishpond may be obtained in a number of ways: namely, direct from a spring or stream by gravity flow or by the use of a hydraulic ram; from an artesian well; from a well of the ordinary type by the use of a windmill; and finally by conserving the rainfall and the ordinary land drainage.

Spring water and artesian well water

Flowing springs or wells are the best sources of water supply for the farm fishpond if the water from them is of the right quality, because this water is most easily controlled, is usually permanently clear, and is warmer in winter than creek water, thus making part of the pond free from ice. Much spring water is free from pollution and dangerous minerals and gases, and may be led directly into the pond. However, water may be tested by placing a few fishes in it; if they remain alive for a week or so, the water may be considered suitable.

On the other hand, water may contain a number of undesirable substances in solution. Such minerals as arsenic, salt, and iron, if present in considerable quantities, are injurious to fishes, and water containing these minerals should not be used in a fishpond. Hard water is undesirable not because of the presence of lime carbonate but because it may contain obnoxious gases: for example, hydrogen sulfide, marsh gas, and carbon dioxide — all of which are injurious. Hydrogen sulfide imparts an undesirable flavor to fish flesh; marsh gas and carbon dioxide, if present

in large quantities, actually poison or asphyxiate fishes. Fortunately water containing the last two gases may be purified by passing it over a series of falls, during which process the gases are replaced by oxygen from the air. In general, the water from springs originating in limestone regions contains much carbon dioxide and should be tested before using. Spring water containing very much hydrogen sulfide should not be used, but, if there is only a slight odor or taste of this gas, it may be eliminated as in the case of marsh gas and carbon dioxide.

A spring should be protected from contamination by surface water and drainage from stables and like places. It is well to dig a basin in the spring itself and to line this with a wall of concrete, loose brick, or stone, which should extend from eight to twelve inches above the surface of the ground. A ridge of clay soil thrown up around this wall will effectively turn away all surface water.

Should it become necessary to build a pond at a higher level than the spring, a hydraulic ram may sometimes be used. It must be understood, however, that only a small part of the water supply, one-seventh or less, can be forced to a higher level; and that for every rise of ten feet from ram to pond, there must be at least one foot fall from spring to ram. The greater part of the water is wasted by this method; hence it is applicable only to a spring of large capacity.

Creek water

A creek not immediately fed by springs, as a rule, drains a rather large area of land; therefore it is subject to great changes in volume, turbidity, and temperature. A pond directly connected with such a creek is likewise subject to the same changes. The temperature is beyond control. The turbidity cannot be regulated without the expenditure of a large sum of money. It is therefore fortunate that these two factors merely inconvenience pond management and do not in themselves seriously affect the healthfulness of the inhabitants of the pond. The volume of water, however, flowing into the pond must be kept within certain limits throughout the year, and to this end special structures are necessary. It is customary to build a low dam across the creek bed, and on one side of the bank of the pond so formed to construct an intake box, from which the desired amount of water can be taken. In locating the dam, two things must be kept in mind: first, the fishpond should be fed by gravity flow; second, the water must not be dammed back on to another man's property without his written consent. Thus the dam should be far enough up stream to feed the pond properly and yet not too near another person's property. A drop of at least two feet from the line fence to the water level in the dam should be allowed.

The form and the arrangement of a structure for regulating the volume of water flowing into a fishpond is shown diagrammatically in figure 170.

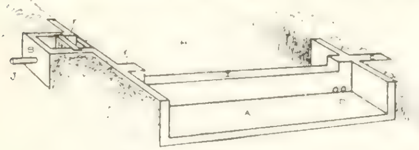

FIG. 170.— *Diagram showing relation of dam and intake box. A, apron; B, intake box; C, core; D, drainpipes; E, bulkheads; F, screen; G, coarse grating; H, stream bed; I, spillway*

The dam need not necessarily be high; from two and one-half to three feet of water in the deepest part of the pond formed by it will usually suffice. The intake box (B) is built in the side of the embankment so that it may be away from the swiftest part of the stream and therefore out of the path of ice and débris coming down during the early spring freshets. At G there should be a coarse grating in order to prevent any large masses, particularly ice, logs, and brush, from entering the intake box. F is a screen, loosely inserted so that it may be withdrawn and cleaned. It keeps leaves and other suspended material from passing into the intake pipe, which enters the box at J. The size of this pipe will depend on the size and the number of ponds to be supplied, but from four to six inches in diameter will be large enough to supply a pond of from four to six acres in extent. For a one-acre pond, the pipe must be at least two inches in diameter. At E on each side of the dam are the bulkheads, which are designed to protect the stream banks and should be as high as are the latter. The spillway (I), where the dam overflows, must be wide enough to allow free passage of ice and other débris during high water. The height must not be so great as to cause the bulkheads and the banks of the stream to overflow, yet it must be great enough to permit a gravity flow from dam to fishpond.

A dam of any sort should be provided with some means for draining the pond above it. A simple way of accomplishing this in small streams is to insert one or more elbows of sewer pipe (Fig. 171, D) in the bottom of the dam in such a place that they may be opened or closed by a person standing on one of the bulkheads. A circular disk made from two-inch planking and just small enough to fit loosely into the flange of each pipe, will serve as a plug. By means of a wire loop, inserted as in figure 171, the disk can be pulled out with a rake or a hook. Each disk should be weighted down with iron or lead and should

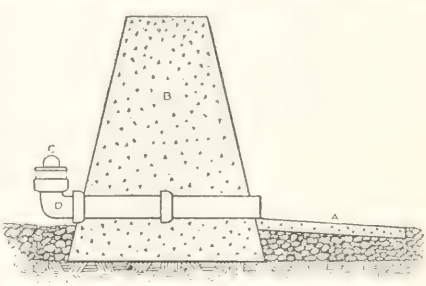

FIG. 171.— *Cross section of a dam showing drain made of sewer pipe. A, apron; B, dam; C, wooden plug; D, sewer pipe*

be soaked in water for a few days before it is inserted into the flange. This will prevent swelling when the disk is in place and consequent breaking of the elbow. The elbows should not be more than eight inches in diameter, and the number to be used will depend on the height of the dam and the volume of water flowing into the pond per minute, which must be calculated in gallons.

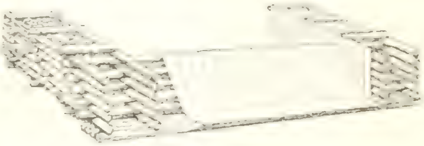

FIG. 172.— *A rock-filled timber dam*

An eight-inch pipe with a head of twelve inches will conduct water at the rate of about one thousand gallons per minute. In order to find the number of pipes required, the number of gallons flowing into the pond each minute should be divided by one thousand.

Reinforced concrete is probably the best material of which to construct the dam. Directions for preparing the forms and mixing the materials may be obtained from booklets published by the manufacturers of portland cement. There are several other materials that may be used, many of which may be obtained right on the farm, such as timber, earth, and rock. Where this is the case, the principal expense is for labor. The manner of construction of one of these dams is illustrated in figure 172. Of whatever material the dam is made, it should rest directly on bedrock or below the stream bed in impervious soil. A fishpond fed in this manner may be situated below the dam on one side of the stream, allowing an embankment of ample width between the pond and the stream (Fig. 173).

Well water

The absence of flowing water should not totally discourage an attempt to build a fishpond, for it is possible by means of a windmill and a good well to adequately supply one of limited size. A pond supplied in this way is described by Dyche under the title, "The Sam Bailey Pond" (page 2018).

FIG. 173.— *Fishpond showing relative positions of dam, intake, pond, and outlet. A, intake; B, outlet*

Surface drainage and rain water

A natural depression in the ground receiving drainage from a rather large area of land may often be made into a pond. If the depression contains soil that is wet or spongy in late spring or early summer, it is still

more favorable. By excavating and lining the depression with clayey soil, it is often possible to conserve the supply of water throughout the dry season. Many good fishponds of this type are to be found in parts of Kentucky and Tennessee, which are subject to longer droughts than are likely to occur in New York.

POND CONSTRUCTION

Size and shape of the pond

How large a pond should be, will depend within certain limits on the amount of fish flesh desired. Taking one pound as the average amount in the rough used by one person in one meal, a family of seven in one year having fish for one meal each week will require roughly three hundred and sixty pounds. While there is no definite data concerning the productiveness of a one-acre fishpond in New York State, the results obtained from a similar body of water in Kansas, as reported by Dyche in 1914, lead to the belief that one-half acre of water will be ample to produce this amount of fish. It must be remembered, however, that the productiveness of a pond is dependent on the stocking and the management, and what is the best method is still an open question. Ease of management must be considered in determining the size of the pond. Several small ponds can be operated more easily than a large one of equal area. An acre is about the maximum size consistent with thorough management.

The shape of the pond will be influenced by that of the area available. If this is not limited, then the ease of management should be the controlling factor. Within certain limits long narrow ponds are more easily cared for than broad ones. While it would be unwise in the present state of knowledge on this subject to set any limit, it may be said that a pond from eighty to one hundred feet wide can be easily managed, and at the same time the bottom topography may be favorably arranged.

Depth and bottom topography

It is generally true that shallow waters are more productive than deep ones, but at just what depth the productiveness materially falls off cannot be stated. One would not be far wrong in making the greater part of the pond less than three feet deep, for in the shallows fishes find their sustenance. In ponds that have a heavy coating of ice in winter, there should be an area at least six feet deep, where the fishes may gather during the cold season. If this is not provided there will be a high mortality due to freezing or asphyxiation. For these reasons the contour of the bottom should be similar to that shown in figure 174; that is, there should be a shallow shelf on each side of the pond with a deep channel between.

For convenience in removing the fishes when the pond is drained, there should be a basin or kettle from fifteen to twenty feet in diameter near the outlet and at least one foot deeper than the contiguous area. The whole pond bottom should be so graded as to eliminate all depressions other than those already mentioned. Every part should slope gently towards the outlet basin.

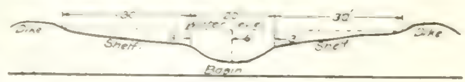

FIG. 174.— *Cross section of the fishpond showing the topography of the bottom*

Excavation and dike building

A pond should first be laid out by driving stakes into the ground indicating both the inner and the outer margins of the dike. The width of the dike at any height should be at least four times the depth of the water at that point. Thus in figure 175 the width from A to B is four times the distance from A to C. The slope AD should be no greater than what is termed a half pitch by housebuilders, and the pond may be managed better if the slope is still more gradual.

The removal of all sod is next in order. It is necessary that this be scraped, roots and all, from every part of the pond and the dike area. The dike will thus rest on bare soil without any grass, roots, or pieces of wood between. Nor should any of these substances go into the dike itself, for they will decay and leave cavities, which will sooner or later give trouble. The sod should not be destroyed, however, for it will be useful in surfacing the dike to protect it from wave action.

The pond may be excavated in one of two ways: namely, by the use of dynamite, or with plow and scraper. The former method will not be treated here, but those who are interested may obtain the necessary information from pamphlets issued by manufacturers of dynamite. By the second method, excavation should start at the center of the pond area and gradually extend in every direction to the dike area. The soil removed may be dumped immediately along the margin to form the dike, but all rocks or other undesirable substances should be taken from it, because the material used to form the dike should be as homogeneous as possible. After each layer of soil from four to six inches deep is uniformly spread, it must be tamped, rolled, or trodden down to insure compactness, and if it is wet during the operation, a greater degree of compactness will result. In this manner the dike is built as excavation proceeds, which saves some labor and time. The top of the dike should be at least two feet above the proposed water level in the pond so that any upheaval

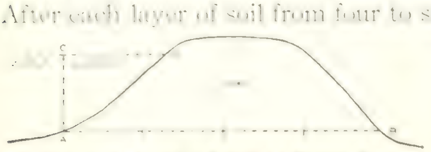

FIG. 175.— *Diagram showing relation between width of dike and depth of water*

due to frost may not be low enough to cause a leak. If more soil is removed from the pond area than is needed for the dike, such excess may be dumped profitably on the outside of the dike and used to increase its breadth.

Inlet

From the intake box at the dam (Fig. 170, page 2012), water may be conducted to the pond either through a pipe or through an open ditch, the bed and the banks of which should be protected against erosion. The bed may be protected by paving it with stones, the banks by planting willow cuttings close together along them. It is well to insert a screen at some point along the ditch or at its entrance to the pond, in order to prevent fish from migrating upstream.

Outlets

The outlet is a very important part of the pond. It must be so constructed as to permit a free passage of excess water without endangering the dike and a complete draining of the pond whenever desired. It should also maintain a fairly constant water level and should be properly screened to prevent the escape of fish. Three types of dependable outlets are illustrated in figures 176, 177, and 178.

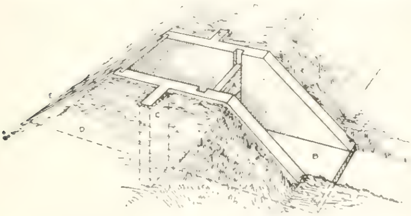

FIG. 176.—*Outlet for pond. A, flashboards; B, apron; C, core; D, embankment; E, screen*

A box of wood or concrete, which has several flashboards (A) that slide up and down in grooves and can be removed when it is desired to drain the pond, is shown in figure 176. When in position, these flashboards regulate the depth of water in the fishpond. A screen (E), inserted in grooves, can be pulled out whenever it becomes clogged. Undermining of the embankment is prevented by an apron of concrete or planking at B. The cores (C) extending well into the dike are generally necessary to prevent seepage at the junction of dike and outlet box. This type of outlet is a convenient one, for almost any water level may be maintained by regulating the number and the size of the flashboards. An additional advantage lies in the possibility of quick draining. It is difficult, however, to prevent leakage at the junctions of the flashboards; therefore this form of outlet can be recommended only for ponds having an abundant water supply in summer.

For ponds having a small water supply in summer, the form of outlet illustrated in figure 177 is recommended. Here drainage is accomplished by means of an iron pipe (F) with a gate valve (G) on the upstream end.

The dike is continuous across the outlet except for a sluice near the top to allow an overflow of excess water. All surfaces of the dike designated by D are protected against erosion by concrete or planking. In place of the iron pipe and the gate valve, sewer pipe may be used with an elbow and a disk plug on the upstream end, similar to that described for draining a pond above a dam (Fig. 170, page 2012).

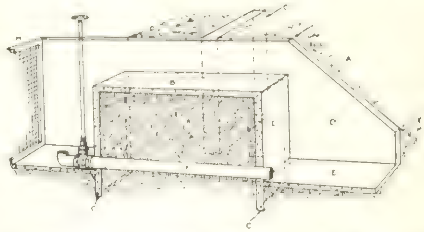

FIG. 177. *Outlet for pond. A, dike; B, overflow; C, cores; D, concrete walls; E, apron; F, drainpipe; G, gate valve; H, screen*

Another inexpensive outlet and drain combined (Fig. 178) consists of the following: Sewer pipe extends under the embankment, as described, and in place of the disk plug, two three-foot lengths of pipe cemented together are loosely set in the elbow. It is necessary to select pipe and elbow that are truly circular and to make the joint as close fitting as possible with cement. This standpipe will maintain a depth of water of a little over six feet, and when it is desired to drain the pond, the standpipe is merely lifted out of the elbow.

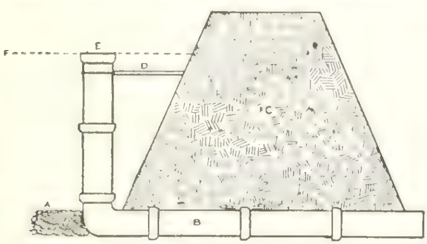

FIG. 178.—*Outlet for pond. A, bottom of pond; B, sewer pipe; C, dike; D, standpipe support; E, standpipe; F, water surface*

Making the pond water-tight

A pond excavated in heavy clayey or loamy soil will seldom need special treatment if the dikes are built compactly and care is taken to have them rest on bare soil. If the soil is light and porous, however, puddling must be resorted to. In certain cases where there is but little sand in the soil, it may only be necessary to loosen the soil in the bottom of the pond with a harrow as the water is first turned in, and, as the water level rises, to continue harrowing around the margin of the pond, partly in and partly out of water. This will roil the water, and the finer sediment will be deposited in the pores of the subsoil. (See description of the Sam Bailey pond, page 2018.) In the case of very porous soils of sand and gravel, it may be necessary to draw in heavy soil and scatter it evenly over the bottom. This should be stirred up when the water is turned in until a very muddy condition results. Subsequent settling will usually make the bottom impervious.

Protection of the banks

In a pond of an acre or more in extent there is likely to be some wave erosion on the banks during severe winds. The sods removed in building the pond may be laid along the dike from a point just below the proposed water level at the top. In case sods are not available, the bank should be liberally seeded to grass, which should be well started before water is turned into the pond. As a temporary preventative of wave erosion, a thick fringe of brush may be laid along the margin of the pond. This is a very effective measure in a newly made pond while the banks are becoming sodded. Finally a few willow cuttings stuck here and there along the margin will help to hold the soil in place, and will also improve the appearance of the pond as well as contribute a certain amount of food for its inhabitants. Willow poles used in this way will soon become trees. The lower twigs, however, should be kept pruned, for otherwise they will constitute a hindrance to the proper management of the pond.

Cost

The cost of building a pond will vary with conditions. If any great amount of excavation has to be done, the cost will be high; nevertheless one must remember that this item will not recur. The pond once properly made and stocked will be permanently productive and will require practically no outlay for maintenance.

THE SAM BAILEY POND

The following is quoted from Dyche's[1] description of the Sam Bailey pond:

Mr. Samuel Bailey lives on the uplands north of the valley of the Ninnescah and about one-half mile northeast of the State Fish Hatchery grounds. He has built a pond almost on the hilltop and its sole supply of water is from a well. The water is pumped by windmill power and carried into the pond through pipes.

* * * * * In size this pond covers an area less than one-fourth of an acre and is circular in shape. It was built by Mr. Bailey at an expense, allowing fair wages for labor, not to exceed a cost of $25, or about five days' work for a man with a good team, a plow and scraper. Of course this does not include the cost of a good pump and windmill. After the pond site had been definitely located, the excavation was made by plowing the ground and scraping the dirt until the pond cavity was about seven feet deep at the center and basin-shaped. The embankment walls, rising about four feet in height, are about six feet wide on top. The embankment surrounding the water represents the amount of dirt that was removed in making the excavation for the pond. After the work of digging and shaping the pond cavity had been finished, the ground

[1] Ponds, pond fish, and pond fish culture. By Lewis Lindsay Dyche. Kansas State Fish and Game Department. 1914.

surface of the pond basin was plowed and harrowed until the soil was thoroughly pulverized. The excavation was then ready for the water, which was allowed to run in until a pool formed in the center. Then a harrow was pulled through and around the pool a number of times. When the water had extended its surface two or three feet farther over the ground in the pond basin the harrowing was continued, half the harrow being in the water and the horses traveling on the dry ground. By the next day, when the water had extended its surface a few feet further, this operation was repeated, and so on until the pond area had filled within eighteen inches of the top of the earth embankment. This method of harrowing and puddling produced an excellent waterproof mud bottom that was quite hard and firm and held water from the very first.

The water for this pond is supplied by a good windmill that works a pump with an eight-inch stroke in a tubular well with three-inch casing and a two-inch point. The water is lifted about 35 feet from a well that is 70 feet deep. The water in the well usually stands within about 32 feet of the surface.

For five years Mr. Bailey has irrigated a three- or four-acre garden patch from this one pond. The water supply seems to be ample, for during a considerable portion of the time, even during a hot, dry summer like the present one (1910), the pond is full of water and the mill is running only a part of the time.

Mr. Bailey has started another pond just west of the one already built. This will give him two ponds with nearly half an acre of water, which he expects to supply with one windmill and one pump. * * * * * *

Mr. Bailey has recently stocked his pond with crappie and bull pout — a yellow catfish. They are doing well, as several schools of hundreds of the young fish have recently been seen feeding near the shore.

SOME FACTS ABOUT FISHES FOR THE POND

Suitable species

The temperature of the water during the hottest days of the year will have something to do with the selection of fish. All members of the salmon family, including the brook trout, the lake trout, and the whitefish, require rather cold water. Any pond the water in which rises to a higher temperature than 70° F., is totally unfit for these fishes. If the pond is fed by springs giving an abundance of clean, cold water, it is very probable that trout will thrive in it; but if the pond is fed by a creek whose waters are exposed to the sun in various shallows, it is suitable for warm water fishes only, such as perch, black bass, sunfish, rock bass, calico bass, bullheads, and the like. While these fishes will live in cold water suitable for trout, they will grow rapidly and reproduce only in ponds the summer temperature of which ranges above 70° F., and a temperature of 85° F. will not harm them. An acre pond of the type described herein will generally have warm water in the shallow parts suitable for warm water fishes, even though it be fed by springs. In this lesson only warm water fishes

will be considered, because the cold water forms require specially constructed ponds and special methods of stocking and management, which cannot be taken up here.

Spawning habits

Fishes deposit their eggs in a variety of places. Several species require a gravel shoal, others sand or mud bottom, and many others spawn directly on vegetation. The spawning grounds of some forms are located in swiftly flowing water, others in quiet water. Some fishes are nest builders and protect their eggs and young; others leave them to their fate.

The small-mouthed black bass is the principal food fish requiring a gravel bed as its spawning ground. In such a bed it excavates a slight depression in which are laid the eggs. The male protects both eggs and young from the depredations of other animals until the young are able to care for themselves. Artificial nests, which are easily removed after the spawning season, are generally used by fish culturists. A nest consists of a wooden box with sides approximately two feet long and open on two adjacent sides (Fig. 179). Coarse gravel is placed on the bottom of the box; then enough of a finer grade is added to make the bed about six inches deep. These nests are distributed about the pond in water varying in depth from eighteen inches to two feet. There should be one nest for every male bass.

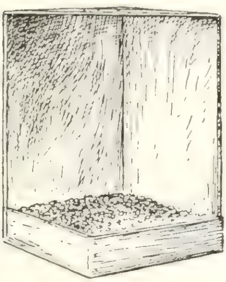

FIG. 179.—*An artificial nest for bass*

Sunfish, rock bass, calico bass, large-mouthed black bass, and bullheads are all nest builders, but they use depressions in mud or sand bottom, particularly near the roots of aquatic plants. The rock bass and the bullheads, however, often make their nests in the bank of the pond or under submerged rocks, logs, or other objects. These latter conditions are easily met by putting broken drainpipes or by anchoring logs along the margin of the pond where the water is from one to two feet deep.

Yellow perch lay their eggs in long cylindric masses, which are generally wound about aquatic plants, submerged logs and brush. A few small cedar trees or some brush anchored here and there in water from three to six feet deep will answer the purpose.

Pike, pickerel, carp, goldfish, and golden shiners throw their eggs broadcast, the last three always where the vegetation is thickest. Their eggs are adhesive, and become firmly fixed to the vegetation. An abundance of aquatic plants will supply the necessary conditions.

Suckers spawn on gravel or sand bottom usually where there is some water current. Beds of gravel and sand placed at the pond inlet may furnish the necessary conditions for a limited number.

Terms applied to young fishes

When a fish hatches from the egg, it has a small yolk sac filled with nutriment. This persists for a longer or shorter time depending on the kind of fish and the temperature of the water. In the case of the fishes that spawn in late spring, the sac is generally carried for a period varying from three to ten days. During this period the young fishes are termed *fry* (Fig. 180), and they require no food other than that carried in the sac. As soon as the sac disappears, they immediately begin to snap at the minute organisms floating or swimming in the water. The young fishes are then called *advanced fry*. When they reach the length of from one and one-half to two inches, they become *fingerlings*, which term is applied until they are one year old.

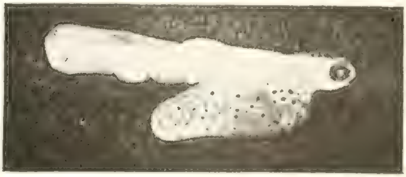

FIG. 180.— *Fry of brook trout*

Rate of growth

The temperature of the water and the amount of available food are two factors among others that influence the growth of a fish. If these are favorable, then the rate of growth will vary with the species and also with the individual. Any person who has watched the rearing of a brood of young fishes has noticed the great variation in the size of

Name	Average length in inches at age of			Spawning season	Advanced fry available	Fingerlings available
	5 months	1 year	2 years			
Common sucker	2	3 to 4	6 to 7	April–May..	June......	August
Golden shiner..	$1\frac{1}{2}$	2	$2\frac{1}{2}$ to 3	May–July..	July......	September
Goldfish.......	$2\frac{1}{2}$	$3\frac{1}{2}$	5 to 6	June-August	July......	September
Carp..........	$3\frac{1}{2}$ to 5	6 to 8	12 to 15	June–July..	July......	August
Bullhead......	$2\frac{1}{2}$	3 to 4	5 to 6	May.......	June......	July
Pike..........	5 to 6	8 to 11	14 to 16	March-April	April......	June
Pickerel.......	4 to 5	6 to 7	10 to 12	April.......	May......	June
Yellow perch...	2 to $2\frac{1}{2}$	3 to 4	6 to 7	April.......	May–June.	September
Rock bass.....	$1\frac{1}{2}$	2	3	May–June..	July......	September
Common sunfish.........	$1\frac{1}{2}$	2	3 to 4	June–July..	July......	September
Bluegill sunfish.	2 to $2\frac{1}{2}$	3 to 4	5 to 6	June-July...	July......	September
Calico bass....	2 to $2\frac{1}{2}$	3 to 4	5 to 6	June.......	July......	September
Small-mouthed black bass...	$2\frac{1}{2}$ to 3	4 to 5	7 to 8	May-June..	July......	September
Large-mouthed black bass...	3	5 to 6	8 to 10	May-June..	July......	September

individuals of the same brood and of the same age. It has been observed that the offspring of a single pair of rainbow trout at the age of five months varied in length from two to five inches. Some of the variation is due to the greater activity among certain individuals, but there also seems to be some unknown inherent factor. It is therefore very evident that the rate of growth of fishes in any pond is impossible of prediction. A rough idea of what occurs in natural bodies of water can be given, however, which will indicate what it should be the aim to produce or surpass in artificial ponds.

FIG. 181.— *One of the crustaceans (Simocephalus) eaten by the larger-sized advanced fry. Enlarged twenty-eight diameters*

The data in the table on page 2021 are based principally on investigations of the rate of growth of fishes in natural bodies of water near Ithaca, New York, but some have been secured elsewhere. Included in the table are also the months in which spawning occurs and in which advanced fry and fingerlings are usually available.

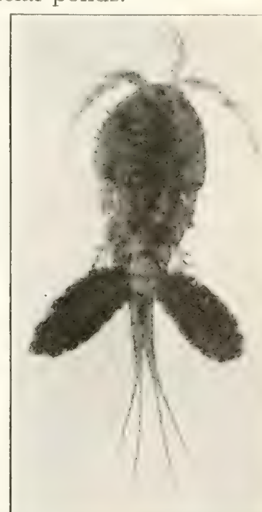

FIG. 182.— *A crustacean (Cyclops) abundant in all stagnant ponds and eaten by all young fishes. Enlarged twenty-eight diameters*

Feeding habits

All young fishes are somewhat similar in their feeding habits, subsisting principally on various small animals including the microscopic Protozoa, wheel animalcules, and the smallest Crustacea of which Simocephalus and Cyclops are good examples (Figs. 181 and 182).

FIG. 183.—*Beginning at the top: common sucker (Catostomus commersonii); golden shiner (Abramis crysoleucas) from life; yellow bullhead (Ameiurus natalis); northern pike (Esox lucius) from life*

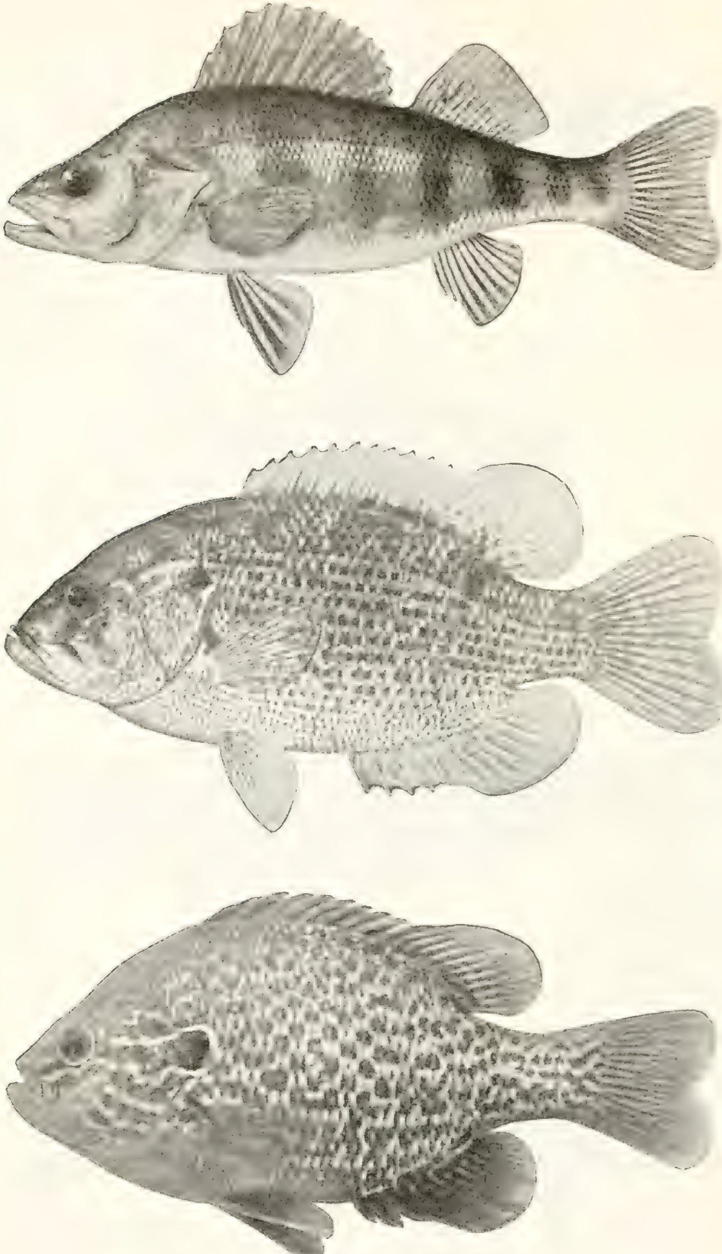

FIG. 184.— *Beginning at the top: yellow perch (Perca flavesens); rock bass (Ambloplites rupestris); common sunfish (Eupomotis gibbosus) from life*

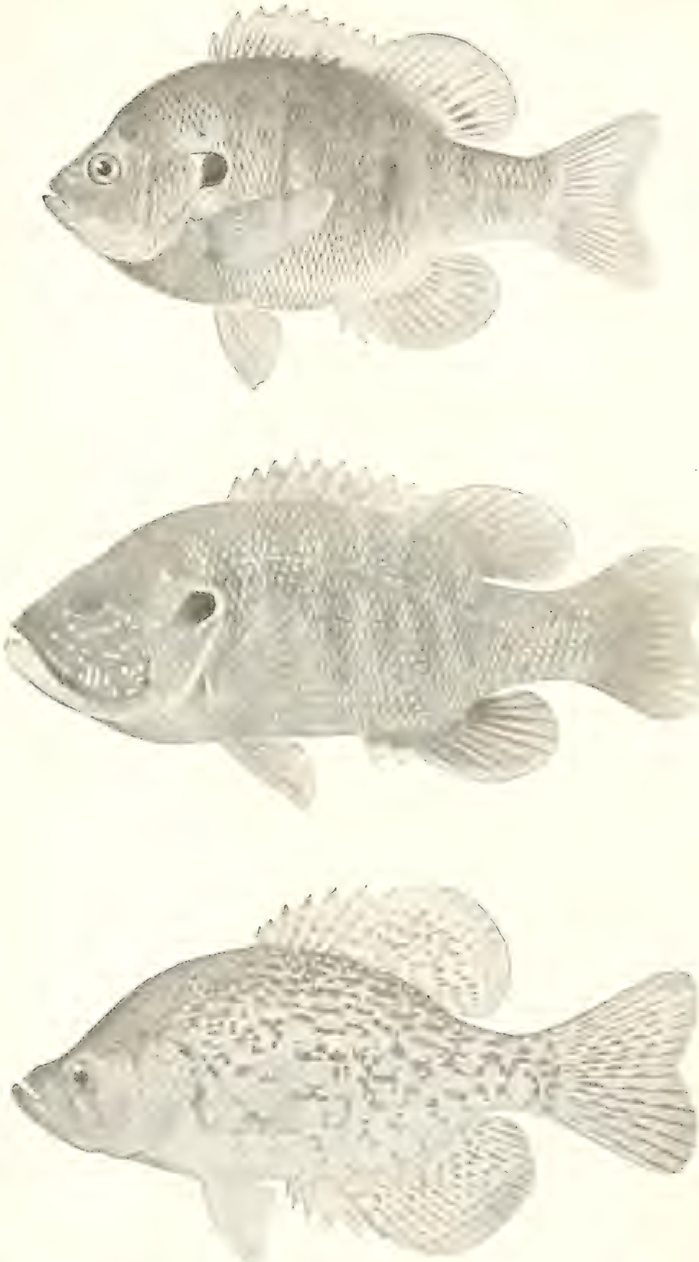

FIG. 185.— *Beginning at the top: bluegill sunfish (Lepomis pallidus); green sunfish (Apomotis cyanellus); calico bass (Pomoxis sparoides)*

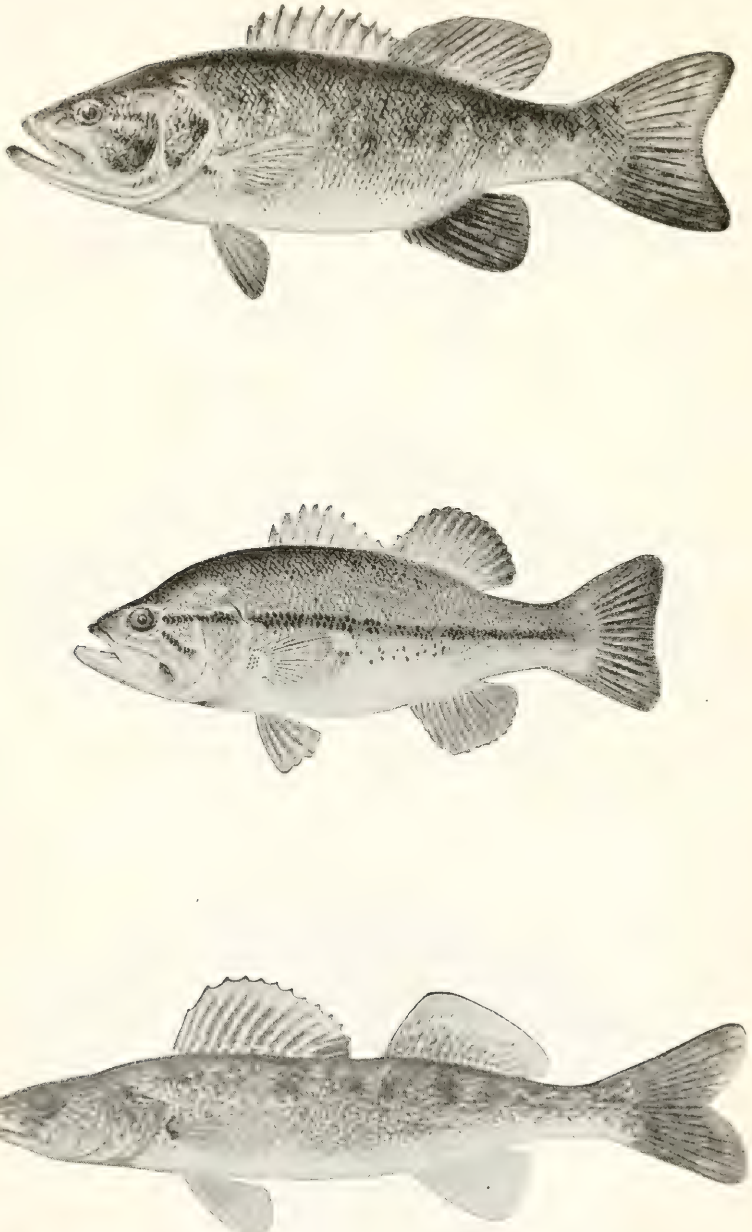

FIG. 186.— *Beginning at the top: small-mouthed black bass* (*Micropterus dolomieu*); *large-mouthed black bass* (*Micropterus salmoides*); *pike perch, or wall-eyed pike* (*Stizostedium vitreum*)

Adults of the common pond fishes of New York State may be placed in four groups depending on the character of their food: namely, (1) vegetable feeders, comprising those that subsist principally on vegetation; (2) omnivorous feeders, which show little if any preference for vegetable or animal food; (3) animal feeders eating insects, worms, snails, small crustaceans, and other animals of moderate size; and (4) animal feeders that are highly predatory on larger aquatic animals, including frogs, crayfish, and the like. In the first group are included carp, goldfish, and golden shiners. The bullhead and the sucker are good representatives of the second group. To the third belong nearly all the common food fishes, such as yellow perch, rock bass, sunfish, and calico bass. Among the highly predaceous forms there are the black basses, the pike, the pickerel, and the wall-eyed pike.

It must be understood that this grouping is not a hard and fast one. Carp, goldfish, and golden shiners do many times eat moderate-sized animals, but it is important that plenty of vegetation be present for their use. Nearly all representatives of the third group also eat crayfish and small fish; likewise the black basses often eat small insects, snails, and worms. Generally speaking, however, the various species seem to prefer the kinds of food indicated by the grouping.

STOCKING THE POND

Putting fish into a pond immediately after it is built would be like turning chickens into a newly plowed field to find their own food. One could expect no greater returns from the one procedure than from the other. Both fish and chickens might get enough worms to last a few days, but famine would eventually overtake them.

A fishpond in order to be successful must provide (1) suitable spawning grounds, (2) abundant forage, and (3) shelter in which young and old may escape their natural enemies. When one is certain that these provisions are fully met, then it is time to introduce fishes. Spawning grounds suitable for the different kinds of pond fishes have been described under "Spawning habits," page 2020.

Food for young fishes

The propagation of minute organisms in great numbers as food for young fishes has been accomplished by the Chinese and the Japanese and more recently by the Germans. For this purpose they have used various organic fertilizers including the manure of sheep and horses. During the last few years the Germans have been experimenting with various commercial inorganic fertilizers, but at the present time, their use is little understood, and there is a great difference of opinion as to their value.

It is not possible to fertilize successfully a pond of the type herein described if there is any appreciable current through it, for the essential elements of fertilization will be rapidly carried away. However, if one desires to try it, a very effective method consists in first building several small ponds, about fifteen or twenty feet in diameter, along the margin of the main pond, connecting them therewith by narrow channels (Fig. 187). By placing well-rotted manure in these ponds at the rate of about three quarts per square yard of pond area and one week later by introducing mud and vegetation from some pond known to contain the necessary organisms, it is very probable that during the course of the next three weeks, there will be enough Protozoa, minute Crustacea, and the like, to feed all of the young fishes that may appear. These small forage ponds must be screened with galvanized woven-wire, having a mesh no greater than one-quarter of an inch. Advanced fry will soon find the forage areas and will pass through the screens, which, however, will effectively keep out the larger fishes.

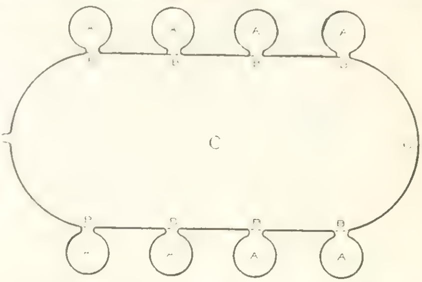

FIG. 187.— *A suggestion for increasing the supply of food for fish in a pond. A, forage ponds; B, screens; C, main pond*

There is every reason to believe that pond fertilization follows the same principles that are involved in the fertilization of land. In the latter case, it is a recognized fact that every field is a problem in itself; this is true in respect to ponds. Hence the amount of fertilizer given in the preceding paragraph for a square yard of pond area is purely tentative. It is merely a starting point from which to vary the amount as experience is gained.

Even in the main pond itself there will be some natural fertilization each year derived from decaying vegetation, from excrement from fishes, and by solution from bottom soil. This will provide small food organisms for a limited number of advanced fry. The production may be increased by the addition of leaves and waste hay or even by a small amount of horse manure. This should be spread along the margin of the pond early in the spring, and, at the same time, the amount of water flowing through the pond should be cut down to the minimum. Only a narrow strip along the margin should be thus fertilized, for if too great an area is so treated, pollution of the whole pond will follow, which will be fatal to the pond organisms.

Food for adult fishes

Insects.— Since there is no known method for controlling the reproduction of aquatic insects in large numbers, one will have to depend on

their chance occurrence. A few insect forms, such as caddis flies, may-flies, damsel flies, midges, and mosquitoes, will undoubtedly come to the pond each year for egg laying, and nearly all of their progeny will probably be exterminated during the same year. There is good reason for believing, however, that the supply of aquatic insects can be materially increased by building a few small breeding ponds along the margin of the main pond and excluding all fishes therefrom (Fig. 187). Certain insects will naturally deposit their eggs in both breeding and main ponds. There are no very destructive insect enemies in the former; hence there are sure to emerge a goodly number of adults, which in turn will continue year after year to repopulate the small ponds as well as the main pond.

FIG. 188.— *Caddis fly larva in a case*

Crustacea and Mollusca.— There are a few forms of Crustacea and Mollusca that may be successfully introduced and that will naturally increase in numbers provided there is

FIG. 189.— *Caddis fly larva in a case*

FIG. 190.— *Adult caddis fly*

an abundance of vegetation. Among the Crustacea there are the fresh-water sow bug, Asellus, and the fresh-water shrimps, Hyalella, Gammarus, and Eucrangonyx. These may be obtained from almost any swamp or marsh having permanent pools containing vegetation. If the plants are pulled up by the roots and rinsed in a bucket of water, the animals will fall off into the water.

Nearly all of the fresh-water snails and small clams, Sphærium, are relished by many pond fishes. The forms illustrated in figure 198 may be collected in almost any pond or stream where vegetation is thick. The food of all of these molluscs consists of vegetable matter, and when planted in a pond with growing plants they will reproduce at an enormous rate.

Aquarists have introduced an African snail of the genus, Limnæa, which has been successfully bred in large numbers in a pond at Ithaca,

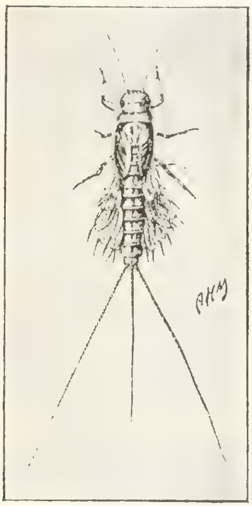

FIG. 191.— *Nymph of mayfly*

FIG. 192.— *Adult mayfly*

FIG. 193.— *Damsel flies: 1, 2, 3, adults; 4, 5, nymphs*

New York (Fig. 197). They seem to be able to stand the cold winters perfectly, even when living in a shallow pond, which freezes nearly to the bottom. Each snail will deposit in one season from five hundred to one thousand eggs, depending on its age. The shells of these snails are very thin and easily crushed, and this may be one reason why sunfish, perch, and black bass eat them so readily.

A B

FIG. 194.— *A midge (Chironomus). A, adult; B, larva*

Forage fishes.— Certain fishes can be made to furnish the principal animal forage crop of the pond, but one should be very careful to select only the proper kinds for this purpose. In order to be desirable in this respect a forage fish should possess the four following characteristics: namely, (1) it must spawn in the pond; (2) its food should consist largely of vegetation; (3) it must be relished by the fishes that it is desired to propagate; and (4) it must not grow so rapidly the first year as to make it too large to be eaten by other fishes.

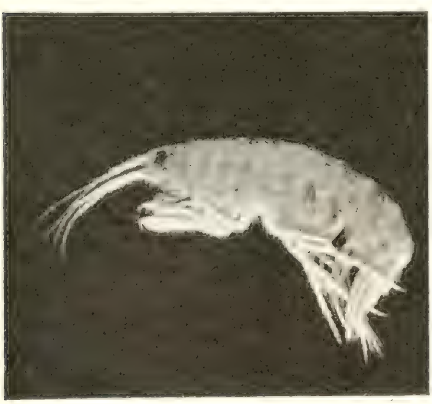

FIG. 195.— *Fresh-water shrimp (Gammarus)*

Fortunately there are two forms easily obtained that fully meet these requirements, the goldfish and the golden shiner. The former may be bought of dealers in aquaria and fancy fishes, while the latter may often be captured in a minnow seine or trap set in a sluggish stream, a pond, or a lake, or may be bought from certain dealers whose names and addresses will be furnished on application to the College.

FIG. 196.— *Fresh-water sow bug (Asellus)*

The carp has been used in ponds as a forage fish, and would be excellent for this purpose were it not for its rapid growth. Pike and pickerel will usually keep it under control, but as a food for bass, perch, and sunfish, it is not recommended.

Ordinary brook minnows are not desirable for the reason that nearly

all of them will eat the eggs and the young of other fishes. They also consume much food useful to other fishes and do not in themselves contribute a permanent supply of food. The common chub, or horned dace, is especially obnoxious in this respect. If the common brook sucker can be made to spawn in the pond, it may constitute a desirable introduction. All predaceous fishes are fond of young suckers, and the latter do not enter into competition with other fishes in their feeding, since most of their food is obtained by scraping submerged rocks, logs, and plant stems.

FIG. 197.— *African snails*

FIG. 198.— *Some common pond molluscs. 1, Limnæa; 2, Physa; 3, Campeloma; 4, Planorbis; 5, Sphærium*

Nearly all predaceous fishes will sometimes eat their own kind, but this will be reduced to a minimum if plenty of shiners and goldfish are present.

Aquatic vegetation

Many of the plants useful in fish culture are rather generally distributed over New York State, so that ordinarily one will have little difficulty

in obtaining them. A half dozen or more desirable kinds may be found in a mill pond, a sluggish stream, or any shallow part of a lake having a mud bottom. Aquatic plants are very important in the economy of pond fishes, and some of the reasons for this are given as follows:

1. They constitute the principal food of a few fishes.

2. Directly or indirectly they furnish food and shelter to a host of small organisms that are eaten by fishes.

3. They are necessary in the spawning activities of certain fishes.

FIG. 199.—*Pondweeds. A, Potamogeton crispus; B, P. amplifolius; C, P. heterophyllus*

4. They purify the water by taking up certain obnoxious substances, including carbonic acid gas exhaled by aquatic animals, and by giving back oxygen.

5. They protect the water underneath them and the pond bottom from the heat of the sun.

Certain plants are objectionable, however, in that they decay readily giving off dangerous substances, which affect the health of fishes and the flavor of their flesh. There are also other plants that grow too rapidly and often seriously interfere with the proper management of the pond. In suggesting the following plants for the pond, the undesirable as well as the desirable qualities have been considered. It must be remembered, however, that certain plants may be valuable in one place and mere weeds in another.

To the Potamogetons, or pondweeds as they are generally called, belong a number of forms desirable in the farm fishpond. Three common

species are shown in figure 199. These and the following species are widely distributed throughout the State and can be recommended as

FIG. 200.— *A, spiked water-milfoil; B, hornwort; C, fanwort, or cabomba*

fulfilling admirably the five functions mentioned heretofore: *P. pectinatus* (fennel-leaved pondweed); *P. perfoliatus; P. obtusifolius; P. robbinsii. P. crispus, P. pectinatus*, and *P. robbinsii* have green foliage throughout the winter; the others die down in autumn. *P. crispus* and *P. pectinatus* are very prolific and on rich bottom soil will be likely to crowd out nearly all other plants. They should therefore be introduced with caution, and it would be well to put them in a place from which they may be easily removed. All these pondweeds, with the possible exception of *P. amplifolius*, will grow in shallow water; the latter is ordinarily found in water from four to seven feet deep.

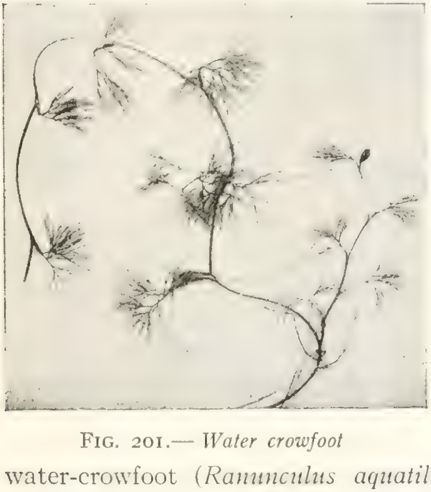

FIG. 201.— *Water crowfoot*

The wild celery, eelgrass, or tape grass (*Vallisneria spiralis*), is another flat-leaved aquatic, which has some value in the pond, but just how much has not been satisfactorily determined.

The spiked water-milfoil (*Myriophyllum spicatum*), hornwort (*Ceratophyllum demersum*), and the white water-crowfoot (*Ranunculus aquatilis*), all with finely divided leaves, are of value because they harbor hosts of small food animals and are

themselves eaten to a slight extent by herbivorous fishes. The milfoil and the crowfoot remain green throughout the winter. None of these, with the possible exception of the crowfoot will become obnoxious from excessive growth. They should be planted where the water is twelve or eighteen inches deep.

The water weed (Elodea) forms very dense masses excellent as shelter for food animals and as spawning places for goldfish and golden shiners, where their eggs and fry may develop unmolested. Care should be taken, however, to keep the water weeds grouped and to prevent the masses from extending over too much of the pond area.

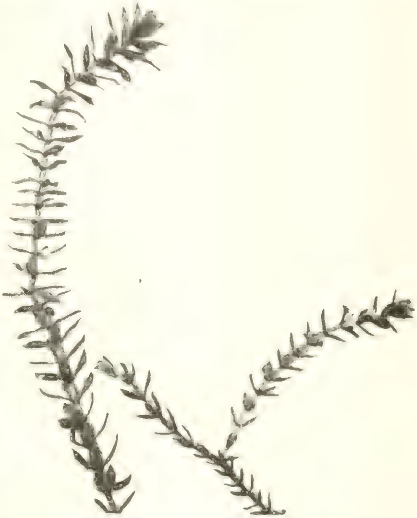

FIG. 202.— *Water weed*

Water cress (*Radicula nasturtium-aquaticum*) is valuable along the margin of the pond, where the masses furnish retreats for fresh-water shrimps, snails, and certain insects. The cress is also a valuable salad plant and should therefore be grown where it may be easily picked.

The duckweeds (Spirodela and Lemna) constitute one of the best vegetable foods for goldfish, and where the latter are present these plants will never become obnoxious. The fact that duckweed is a floating plant is in its disfavor, for if it becomes very abundant, trouble will be experienced in keeping the outlet screens clean.

The white- and the yellow-flowering water-lilies (*Castalia odorata* and *Nymphæa advena*) are valuable for their attractive blossoms, for sheltering the bottom of the pond from the heat of the sun, and for the numerous minute organisms that live on the stems. Sunfish and large-mouthed bass will often build their nests on the roots of water lilies. They seem also to prefer the shelter afforded by the broad, floating leaves of the white lily to that afforded by many other plants. On rich soil these plants may eventually take possession of the pond at the expense of other more desirable forms; therefore it is well to keep them in clumps and when too much spreading is imminent to remove the offending shoots. If some of the outer rootstocks are removed each fall, lilies are not likely to become a nuisance.

There are certain other plants commonly recommended by fish culturists including the algæ Chara and Nitella, more commonly called water moss,

but until more is known about their relations to the desirable pond organisms, it is unwise to advise their introduction.

Among the lower plants many are exceedingly important as forage. The smallest animals constituting the food of young fishes subsist largely on microscopic algæ, as do hosts of herbivorous aquatic insects. The filamentous forms, including Spirogyra and others commonly called "frog's spawn," are eaten by goldfish, golden shiners, snails, and certain insects. Enough of these lower plants will be introduced with the other aquatic plants to answer the purpose. The greatest trouble has been experienced in controlling these algæ in the pond; however, it has been the writer's experience that when goldfish are present, this difficulty is eliminated.

Water plants collected by the reader may be sent to the Department of Botany, College of Agriculture, Ithaca, New York, for indentification. Such plants should be packed so that they will not become dry in the mail.

Procedure in stocking the pond

Late April or early May is a good time to commence stocking the pond. The aquatic plants should be the first organisms to be put into the pond. It will be well to collect specimens of as many plants as are available at this time in order to test the desirability of each in a particular pond. In setting out the plants, specimens of each kind should be placed in clumps by themselves, and the clumps distributed at intervals of twenty feet or so along the pond shelf. By following this method any species that may become undesirable can be the more easily removed. In collecting water cress and water lilies care must be taken to secure an abundance of roots or underground stems; all other plants may merely be pulled up without roots. A most effective way to plant the latter is to tie a stone to the plant stem and toss the whole into the pond at the proper place. Roots or holdfasts will grow out in a very short time securing each plant to the bottom.

The forage animals should be collected next. As has been stated, until more is known about the propagation of aquatic insects, it will be impossible to give definite and reliable directions for their introduction. Certain desirable forms will naturally be attracted to the pond for egg laying, and for the present this natural method of propagation is the only one to be depended on. Fresh-water shrimps, water sow bugs, snails, and small clams should be collected, for too many of these cannot be introduced into the pond. The first two forms should be placed along the margin of the pond in the water cress. It makes little difference where the others are put, but it is probably best to distribute them in the other vegetation, keeping together those of the same kind.

If some of the vegetation is started the fore part of May and followed immediately by the introduction of the small forage animals mentioned, all will be fairly well established by June, when the vegetable-eating fishes may be introduced.

As given in the table on page 2021, the spawning season for goldfish and golden shiners extends from May into August. Therefore if the pond is stocked with adults the fore part of June, part of one season's spawning will probably take place in the pond the first year. Goldfish and shiners will spawn when one and two years old, respectively, but the number of resulting young will not be so large as when older spawners are used. In order to fully stock an acre pond with goldfish and shiners, approximately four hundred pairs of the yearlings of the former and the same number of two-year-olds of the latter will be needed. This number may be divided by two in case older fishes of each kind are used. It is not desirable, however, to stock the pond fully until it is fairly well covered with vegetation. In ponds having rich bottom soil this may be the case toward the end of the first season, but ordinarily two years will be required. It is therefore suggested that only about one hundred pairs of goldfish and the same number of shiners be introduced in June of the first year. Others may be added the second and the third year in numbers sufficient to fully stock the pond.

The final stage in the stocking procedure consists in planting the edible fishes, bass, perch, sunfish, and the like. One may use any size of fish, provided all are alike. The larger the stock fishes, however, the better are the chances of their reaching maturity and also the greater the cost per fish. Which are the more economical to use, fry or fingerlings, is still a much discussed question.

The proper time to introduce stock fishes will depend on the condition of the pond and the availability of the fishes. Stocking should not be attempted until the pond has had time to develop forage. Yearlings or larger fish should not be planted until at least one summer has elapsed since the completion of the pond. Fingerlings may be introduced in the fall after the first summer, while fry and advanced fry will do little harm if planted in June and July of the first year.

All the fishes mentioned in the table on page 2021 are good food fishes, but pike and pickerel on account of their voraciousness cannot be propagated unless special provisions are made for their nourishment. Among the other fishes mentioned a selection will naturally be determined by individual taste. If it is so desired, some of each kind may be used. However, nothing would be gained by introducing both species of bass, for so far as the flavor of the flesh is concerned, one form will probably be as good as the other in a pond of the kind under consideration. The

large-mouthed bass has the advantage in two particulars: namely, it grows a little more rapidly, and it will find its own nesting site in the vegetation.

The number of stock fish to use will depend on the size of the fish. The principal thing to be kept in mind is that overstocking leads to overcrowding, which generally results in the pond's containing a large number of undersized, poorly fed fishes or a very few overgrown ones, which have lived at the expense of the weaker ones. If sexually mature adults are used, only a few are necessary to stock a pond of one acre. Probably twenty-five or thirty pairs of black bass and double this number of any other species will be sufficient. In the case of fingerlings and advanced fry probably two or three thousand would not be too many of the former and from four to six thousand of the latter.

The procedure in stocking a fishpond is summed up as follows:

1. Aquatic plants are the first organisms to be planted in the pond. They should be started as early in the spring as possible.

2. The various smaller food animals, such as the Crustacea and the Mollusca, should follow the introduction of the plants immediately.

3. The first year during the fore part of June, the forage fishes, goldfish and golden shiners, should be added to the number of one hundred pairs of each.

4. Advanced fry of the edible fishes may be planted when available during the first summer, fingerlings in September and October, but yearlings or larger should not be planted until the second summer.

5. The suggested numbers of the edible fishes per acre of water are about twenty-five pairs of adult black bass or fifty pairs of any other kind, from two to three thousand fingerlings, or from four to six thousand advanced fry.

POND MANAGEMENT

The kind of pond described in this lesson is designed to take care of itself; there are certain agencies, however, that tend to decrease its productiveness and must be considered. Also, the fish crop must be harvested and otherwise cared for. The management of the pond, therefore, will be concerned principally with these two considerations.

Protection against obnoxious animals

There are many wild creatures that often constitute a menace to the success of the pond. Among birds, kingfishers, night herons, little green herons, and domesticated ducks and geese, are known to devour large numbers of young fishes. Ducks and geese are perhaps the worst offenders in that they also destroy the pond vegetation and hosts of small food animals living on these plants. If one desires to raise ducks and fish

too, the former must be kept away from the fishpond. The night herons and little green herons are beautiful birds and probably do little harm along the public watercourses. Yet in the private pond where fish are more abundant and less easily frightened, they are obnoxious in two different ways: first, from their habit of devouring young fishes; second, from the fact that they are carriers of certain parasites that infest fish, especially the black bass. The shotgun is an effective agent for preventing their depredations, but it should not be used unless herons become numerous and regular pond visitants, and until it is evident that scarecrows are ineffective.

Mink and muskrats sometimes do much damage, the former by capturing large edible fishes, and the latter by burrowing through the pond banks. The steel trap or the poisoned bait, if judiciously used, will keep these offenders in check. One must be constantly on the lookout for muskrat burrows, and whenever one is found, it must be deeply plugged with clay.

Rubbish accumulations

After every heavy rain and particularly during the spring freshets rubbish is likely to accumulate at the dam. Ice jams are especially dangerous. All rubbish should be speedily pushed over the dam with poles or hooks and sent downstream.

The screens at the intake and the outlet often become clogged with floating débris. Mats of green algæ often cover them in late spring, and in the fall floating leaves are very troublesome. If the screens are of the sliding type, they are easily removed and cleaned. With permanent screens much of the coarse material can be raked out and the finer material forced through the meshes with a stiff brush or broom.

Regulation of the water inflow

In ponds containing warm-water fishes, it is not necessary during the warmer months to have any perceptible current. Some of the most successful fish culturists permit an inflow sufficient only to maintain the proper level of the pond. The loss of young fishes and food animals, which would ordinarily pass through the outlet screens, can be eliminated if there is no overflow at this point. The inflow should not be reduced, however, until the vegetation has commenced its spring growth.

During the colder months a good volume of water should be allowed to flow through the pond. This will often prevent the formation of a thick coating of ice in the vicinity of the inlet. It will also keep the fishes, then congregated in the pond basin, well supplied with freshly oxygenated water, and hence reduce to a minimum the danger of suffocation, which might otherwise occur.

It is advised, therefore, that the inflow be large from about October first to the fore part of May, and that at other times it be reduced to an amount sufficient only to maintain the desired water level.

Fishing the pond

In a pond run merely to meet the demands of a family or two, there will hardly be a desire to harvest the total output at one time; consequently there need be no special outlay for fishing equipment. Fishing with hook and line will no doubt be the popular method in a large number of cases. Many times, however, the largest and most desirable fishes refuse to be caught by ordinary methods of angling, and one must resort to the use of such contrivances as the set line, the seine, and the fish trap.

The set line is too well known to need explanation. By its use one may be as certain of capturing a considerable number at almost any time as with almost any other device. There is one bad feature, however, in that undersized fishes so captured are generally injured beyond recovery.

A seine fifty feet long with a liberal bag at the center will be serviceable in places where vegetation is scant, but useless where it is dense. One other disadvantage is that it requires two or more persons to operate it successfully. Should it become desirable to use a seine, one having meshes no smaller than one and one-half or two inches should be selected, so that all undersized fishes may escape without injury.

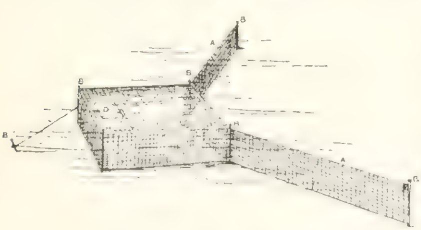

FIG. 203.— *Wire fish-trap*

The fish trap is one of the most efficient devices, and at the same time one causing the least injury to entrapped fishes. In general it consists of two wings converging toward a funnel, which opens into a compartment. Fishes easily find their way through the funnel into the compartment, but on attempting to return are rarely successful. A trap, which any one can easily make of chicken wire, is illustrated in figure 203. It is held in place by means of pegs (B), passing through wire loops at the various points indicated. These pegs should be about as large as broom handles, so that they may be inserted easily by hand. If the wings (A) are independent of the box part of the trap, the latter can be the more easily taken up and emptied. D is a door of sheet iron, which may be secured with a padlock. The funnel leads to an opening from three to four inches in diameter, and through which the fishes pass to the compartment (C). The wire to be used in the construction of the

trap should have a mesh of one and one-half or two inches. This will allow all but fish of edible size to pass through unharmed. Each wing should extend at least six feet out from the funnel, and even a greater distance would insure a larger catch. The compartment ought not to be so large that it cannot be easily taken up and emptied; it has been found that one two feet wide, one foot deep, and three and one-half feet long works satisfactorily.

Another style of trap, commonly called the fyke net, is shown in figure 204. This is usually made of cotton netting supported by wooden hoops. A small one can be bought for from three to five dollars. The fyke net can also be made by hand, but not so easily as the wire trap. It is a short-lived affair, since the cotton netting rots out in one season of continuous use.

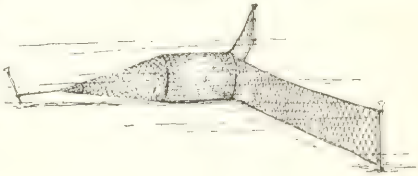

FIG. 204.— *Fyke net*

Fishing in public waters with these contrivances is illegal and punishable with a heavy fine. It is therefore important that their use be confined to the private pond.

Keeping fish alive for future use

One may desire to preserve alive part of a large catch of fish, and this may be easily done by providing a pen in the pond itself or a floating fish-car.

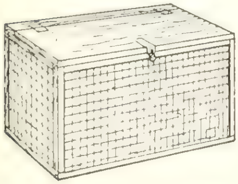

FIG. 205.— *Fish pen*

An easily made pen is illustrated in figure 205. It consists of a board bottom with wooden corner posts about two feet high and wooden rails extending between the posts at the top. The sides of the frame are covered with chicken wire, although wooden slats placed about three-quarters of an inch apart will suffice. If desired, a cover may be hinged to the top rail and secured with a lock. A pen two feet by four feet and about two feet high will safely hold a dozen fish of fair size for a period of one week. The pen should be set in water not over a foot and one-half deep and in an easily accessible place, either near the shore or at the end of a small pier. When the pen is first set in the water, it may be necessary to spread some gravel over the bottom to prevent it from floating.

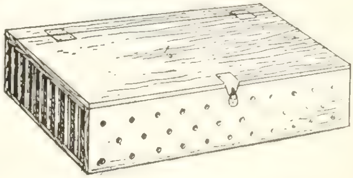

FIG. 206.— *Floating fish-car*

The floating fish-car may be merely a rectangular box with ends of slats or chicken wire (Fig. 206). A wooden cover properly hinged

and locked prevents the depredations of night prowlers and eliminates all loss of fish caused by their jumping proclivities. Such a car may be easily floated to any part of the pond.

How soon after stocking may the pond be fished?

How soon after stocking may the pond be fished is a question that will occur to all, and one that cannot be definitely answered. It will depend on the growth of the fish, which, as has already been stated, is uncertain. A few individuals of all food species, particularly perch and black bass, may be large enough to catch at the end of the second summer, but the average fish will require three summers at least before it is fit for the table. If it is desired to make a catch toward the end of the second summer, the trap or the seine should always be employed. Hook and line fishing should be indulged in only after the third season, when the larger fishes are in the majority.

After a pond has been in operation for three or four years, there will be a few overgrown fishes lying in the deeper water. Every effort should be made to remove these, for they are very destructive. A few bass weighing three or four pounds each, will eat up practically every other living fish in the pond, including even the adult shiners and many of the adult goldfish. If all other methods of catching them fail, the pond should be drained; whereupon the obnoxious fish can be removed from the pond kettle.

Pond draining should take place in the fall or the early spring. The vegetation will give the least trouble at the latter time, and on account of the high water the pond can be more quickly refilled. Draining in summer would undoubtedly disturb the breeding of many fishes and would mean the almost complete loss of food animals and very young fishes.

SOME USEFUL WORKS ON FISH CULTURE

A manual of fish-culture. U. S. Commission of Fish and Fisheries. Revised edition. 1900.

Separate chapters only now available. A standard work detailing the methods employed in the national hatcheries.

Modern fish culture in fresh and salt water. Fred Mather. 1900.

Fish culture in ponds and other inland waters. William E. Meehan. 1913.

Domesticated trout. Livingston Stone. Sixth edition. 1901.

A classic work of international reputation giving the minute details of trout culture.

An angler's paradise and how to obtain it. J. J. Armistead. 1895.

The most important British work on trout culture.

The habits and culture of the black bass. Dwight Lydell. Bulletin U. S. Fish Commission, 1902, pages 39–44. Transactions American Fisheries Society, 1902, p. 45–57.

The cultivation of fishes in natural and artificial ponds. Charles Haskins Townsend. Eleventh Annual Report of the New York Zoological Society. 1907.

Ponds, pond fish, and pond fish culture. Lewis Lindsay Dyche. Kansas State Fish and Game Department. 1914.

Excellent for fish propagation on the farm.

ACKNOWLEDGMENTS

Parts 1 and 3 of figure 183, parts 1 and 2 of figure 184, parts 2 and 3 of figure 185, part 3 of figure 186, were taken from *Fishes of Illinois* by Forbes and Richardson.

Part 1 of figure 185, part 2 of figure 186 were taken from *Fishes of North Carolina* by Smith.

Part 1 of figure 186 was taken from *The Seventh Report of the Forest, Fish and Game Commission of New York.*

Figure 190 is from a photograph by J. T. Lloyd.

Figures 191 and 192 were taken from *A Contribution to the Biology of Mayflies* by A. H. Morgan.

Figure 193 was taken from *Life Histories of Odonata* by Needham, New York State Museum Bulletin 68.

TABLE OF CONTENTS

CORNELL STUDY CLUBS

At the close of the harvest season neighbors and friends find it natural and easy to visit together during the lengthening evenings and talk over the common experiences of the passing season. The Cornell study club begins to feel that the time is at hand to arrange plans for the year's study and for community advancement — educationally, socially, and financially. It is often helpful during the fall to hold a special meeting, invite every one in the community to attend, and see that each one has an enjoyable and profitable time. A successful meeting, largely attended, provides an opportunity to increase the membership and secure greater interest in the work of the club. Although Cornell study clubs are conducted generally by local leaders, it may be advisable to obtain an outside speaker if possible for the special meeting. The Supervisor of the Reading Course for the Farm, College of Agriculture, Ithaca, New York, will be glad to cooperate with clubs as far as possible in arranging the program of the special fall meeting.

For the assistance of readers who would like to form a group for the study of agriculture or who would like to organize a Cornell study club as a means of promoting community welfare, information on study club work is given below.

Cornell study clubs are local organizations, which aim to promote the study of Cornell reading course lessons and to serve the community. One of the chief benefits of these clubs is that they furnish an opportunity and an incentive for study. Often a helpful lesson will reach a farm home at a time when the members are too busy to give it attention, and it is soon forgotton. If, however, a special time is set aside for the study of reading course lessons at a club, it is likely that much more reading will be accomplished. The secondary purpose of Cornell study clubs is to increase a neighborly feeling in the community and to offer an opportunity for an exchange of thought on subjects of common interest. In the meetings of a club the members should find enjoyment in an interchange of ideas and a training for free and orderly self-expression. Clubs may bring about cooperation in matters of public concern, and may grow to be influential factors in promoting community welfare. They may also prove of financial benefit by becoming agencies for cooperative buying and selling. The success of the Cornell study club depends principally on local leadership.

The organization of a Cornell study club can be easily effected even if at first only half a dozen persons desire to form a group. The president and the secretary of the club should be chosen, and the dates and places for meetings decided on. The meetings should be held frequently enough to maintain an active interest in them; regularly every two weeks during

the fall and winter is usually considered sufficiently often. If it is not advisable to meet every fortnight in spring and summer, monthly meetings are suggested. Study clubs hold their meetings in churches, grange halls, and at the homes of the members. The programs should be planned carefully several weeks in advance, and the leaders should be selected and held responsible for the success of the meetings. Reading course lessons should be obtained by the secretary of the club and distributed to the members at least one week in advance of a meeting, so that the members may be prepared for a general discussion, which should follow the opening talk given by the leader. The meetings should proceed under a definite order of business.

Each study club should first become fully informed as to the material available in the two reading courses. The reading course for the farm discusses farm practices and important rural problems. The reading course for the farm home takes up such household subjects as sanitation, foods, household management, and household furnishing. If the study club is composed of men, reading course lessons should be selected that are related to local agricultural conditions, and deal with operations in progress at the time of year in which they are being discussed. Valuable suggestions for a club composed of women will be found in *Cornell Study Clubs*, Cornell Reading Course for the Farm Home, Vol. I, No. 13. A number of Cornell study clubs are promoting very successfully the study of the two reading courses, and are reaching both the men and the women of the community. Some of the clubs discuss farm subjects and farm home subjects on the same program; others divide into two groups for separate discussions, and hold the remainder of the program in common. If a club desires to undertake this more general organization, it may prove mutually advantageous to men, women, and young people in many practical ways. Moreover, such a club may have the inspiration of a larger membership and may exert a wider influence.

Cordial cooperation in establishing study clubs may be obtained by writing to the Supervisor, Reading Course for the Farm, College of Agriculture, Ithaca, New York.

SUPPLEMENT TO

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

VOL. IV. No. 94 | AUGUST 15, 1915 | COUNTRY LIFE SERIES No. 3

THE FARM FISHPOND

DISCUSSION PAPER

A discussion paper is sent with each reading course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully, and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, INSECT, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, the reader should sign and return this discussion paper, whether the questions are answered or not.* By means of reading course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading course work, and also for names and addresses of residents of New York State likely to become interested in the Cornell Reading Course for the Farm.*

(In answering questions, attach additional paper if needed and number the answers.)

1. How many pounds of fish would your family be likely to consume in one year?

2. Give the area of a pond necessary to produce this amount.

3. Name four ways in which water may be supplied to a fishpond.

4. Name three objections to the construction of a fishpond by merely damming up a stream.

5. With reference to a combination dike and excavated pond, state how the ground should be prepared for building the dike, the thickness of the dike, and how to make the pond water-tight.

6. What do you think would be the cost of building a half-acre pond? the cost of maintenance?

7. Name the fresh-water fishes you prefer for home use.

8. State briefly the steps to be taken in stocking a fishpond. How soon after stocking may one expect to harvest fishes of edible size?

9. Have you a pond that supplies your family regularly with good, wholesome fish? If so, give an idea of its size, its depth, its water supply, the kinds and the number of fish produced annually. Are there other fishponds in your neighborhood? If so, will you kindly give the names and the addresses of the owners.

10. What reasons can you give for not having a fishpond on your farm?

11. Would you be interested in further information about receiving stock fishes free?

Name. . . . .

Address. . . . .

Date. . . . .

(*Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.*)

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

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VOL. IV. No. 96 | SEPTEMBER 15, 1915 | COUNTRY LIFE SERIES No. 4

THE SURROUNDINGS OF THE FARM HOME

E. GORTON DAVIS

The possession of attractive home surroundings is not beyond the reach of any one who has a home of his own. In fact, there is little relation between the size, the costliness, or the simplicity of a home and its

FIG. 207. BEAUTY BY SIMPLE MEANS
Such homes are made by their owners alone, and their simplicity becomes their charm

surroundings as compared to the attractiveness that may be given it by proper arrangement and careful upkeep. Beauty is not measured by cost, and ornament of any kind is not needed so much as a neat and well-kept appearance.

The importance of pleasant home surroundings is not fully realized, although most persons desire to have them presentable. Few appreciate the value of homelike and inviting surroundings as a background for family life. In fact, an ideal home and home life is the reward for which

most persons strive. There is, of course, a pleasure in the possession of a home of which one may be proud, but there is an obligation on all men to furnish attractive settings for their homes. To live long with pleasant surroundings is to realize the value of their influence, and to become assured that such inspiration is needed for work and for rest. The poor of the cities, when they are marketing, will not hesitate to buy from the flower stands some bright-colored geraniums to cheer their dingy rooms. One might ask what use they can have for such things, or how they can afford flowers. On the other hand, those who live in the country may have scenes of beauty all about them, yet this does not necessarily supply a want of homelike attractiveness in their immediate surroundings. The owner of a little cottage garden, over the gateway of which was the inscription, " Be its beauty its sole duty," had the right spirit.

BEAUTY BY SIMPLE MEANS

Farm homes may be made beautiful by very simple means. There must first of all be neatness and orderliness; these, combined with a good sward about the house and a sheltering growth of trees and shrubs, may be all that is required.

By way of example, there may frequently be seen in New York State, the small, low, weather-stained cottage with one of its corners enveloped and perhaps overtopped by a large lilac bush. Not even a porch has been added to its unassuming front, and the single door, looking in the direction of the barns, is adorned and shaded by an ample canopy of vines. The immediate surroundings afford only a well-kept greensward, and, where the feet have worn this away, broad, smooth stones are firmly held in place by the encroaching turf. These limited home grounds are surrounded by only a trim and orderly barnyard, an orchard, and a vegetable garden, flower-bordered at the edge of the lawn, but everywhere is the evidence of thrift and care. One would not add a single touch to the completeness of such a scene; such homes are made by their owners alone, and their simplicity becomes their charm.

It is the interested hand of the owner that counts for more than a wealth of materials in the development of home landscapes. The spirit of the giver, the loving hand of the gardener, shape the growth day by day and year by year. From his own stock of materials he devises useful things that are beautiful, and gives freely the labor and the care that are needed rather than dollars. Some one has said, " Show me the garden a man has made, and I will tell you his character."

Among the more prosperous rural homes there may be evidences of injudicious expenditures, which mar rather than help. Plain old houses have had fancy porches added to them; more modern ones, lacking the

country-like simplicity of the older dwellings, are tricked out with jig-saw patterns and gingerbread fretwork, frequently made worse by the use of many garish colors of paint. Often the old house, seeming scarce worthy of a porch, or even of paint, gathers unto itself a complement of old shrubs and vines, harmonizing with its weather-beaten grays, and looks far better.

Good white lead was the best paint for the farm and village home in bygone days and is the best to-day for both appearances and wear. If the blinds of a white house are painted green, there will be sufficient relief and contrast, and this white and green may well be the entire color scheme for all that needs paint. A house that has too much "trim" about it will be vastly improved, and the jig-saw work made inconspicuous, if it is all painted one color, preferably white.

FIG. 208. SIMPLICITY IS BEST
The interested hand of the owner counts for more than a wealth of materials

Mistakes are also made in the selection and the planting of trees and shrubs. With the best of intentions, purchases of shrubs are made under the guidance of the showy illustrations of the nurseryman's catalog, and a collection of novelties is bought rather than trees and shrubs known to be especially fitting and useful. Without a definite plan — for there can be no plan to suit all these plants — they are aimlessly scattered usually on the lawn. Its smooth turf is broken up, and what might have been a good lawn becomes neither lawn nor garden. Such areas, dotted over with individual shrubs, may be well tended; the whole place may show care; there may be a profusion of foliage and flower; but there is absent the quiet, restful effect of simple charm and completeness of scene, which is characteristic of the ideal cottage home.

THE PURPOSE OF THE FARM HOME

A farm home is both a residence and a place of business. As the farm business is but a means to the home life, it is of first importance that the

farm as a whole should make for pleasant home life. If it is true that the most important crop on the farm is the children, then the most important function of a farm is that of supporting a good home. Certainly no one will gainsay the fact that if every child were in a home, and every home in a garden, many of the problems of life would be solved. Since the farm as a whole has its general purpose, so will the house, the barns, the fields, the farmyard, and every part of the farm have its individual purpose. And just so far as each one of these parts serves its purpose best, so will it help the whole farm to be an ideal home.

FIG. 209. THE WRONG TYPE OF RURAL ARCHITECTURE
Tricked out with jig-saw patterns and gingerbread fretwork, frequently made worse by many garish colors of paint

Since the house is headquarters, it should be connected with the highway and the barns by serviceable walks and roadways. And as the chief place it should have an attractive setting. That is the main purpose of the yard. By a setting is meant two things: first, the house should have as a background a sufficient growth of trees and shrubs to give it a protected appearance; second, the setting should afford opportunity for pleasant outdoor life on lawns and in shaded corners.

The purpose of the various farm buildings needs no explanation; yet from the way such buildings are scattered about on some farms, it would not be very easy to do the chores.

The orchards, while not primarily intended to serve an æsthetic pur-

pose, may form the most beautiful parts of the farm. An orchard of standard apple trees could well be planted near the house to become a part of its background of surrounding trees. Nothing is more country-like than an old apple orchard, and to turn it to the purpose of decorating the home grounds illustrates how each part may help, in several ways, to promote the purposes of the farm as a whole.

Fields and meadows that may be classed strictly as farm lands will always be attractive when well tilled. Good farming is good-looking farming. No calendar is needed for reading the signs of the seasons in the

FIG. 210. THE SIMPLE HOUSE DESIGN
If the blinds of a white house are painted green, there will be sufficient relief and contrast

vivid sap green of the spring, the deeper tones of the waving summer fields, the colors that betoken harvest, and the restful white of winter, to say nothing of the changes that have marked the seasons' progress.

The influence of farm environment has a subconscious but potent effect on children. Even while the barn is only a playground, it should be a silent example of orderliness and thrift; woodlot, meadow, orchard, and field should be likewise living examples of good farming.

Pleasant home surroundings are important both for the welfare of the individual home and for the future of country life. Is it reasonable to expect that wide-awake young people of the country will hesitate to leave a place that does not afford pleasant and attractive working and living conditions?

Therefore the farmstead needs to be considered as a whole. It is not a question of roses or daisies, porches or fresh paint, broad lawns or tidy dooryards, but one of having living places that, in their whole effect, are pleasant and elevating to older folk and children alike.

HOW A COUNTRY HOUSE SHOULD LOOK

Showy ornament has no place about a farmhouse. The most unassuming building should have broad, spreading lines. It should be wider than it is high, because such proportion is in harmony with the amplitude of the country. The city house may be tall and narrow as the result of high property values, which make for narrow lots. An example of the city type of house may be seen in figure 209. A comparison with the building shown in figure 210 indicates that the latter is the more satisfactory for a country setting. While this colonial type, characteristic of the older farmhouses in this country, may have been too low to permit sufficient circulation of air in the bedrooms, this fault may be remedied without departing from its general lines. However, every foot of height added to ceilings adds two steps to the stairways, and may make necessary another ton or cord to the supply of winter fuel.

FIG. 211. DOORWAYS ARE NECESSARY FEATURES

To use simple, strong woodwork about them is to most fittingly apply decoration to the house

If one thinks he can afford to ornament his farmhouse, he might better first apply his means to substantial construction — to the use of first-class materials, to having ample fireplaces, and to good workmanship. His means might well be shown in broader eaves and in heavier posts on the porches. Doorways, stairways, and windows are necessary features; to use simple strong woodwork about them is to most fittingly apply decoration to the house. The eaves mark the meeting of roof and walls, and should appear to be a substantial tie between the two. While a comparatively slender post will actually support a porch roof, a

heavier one will look more solid and dignified, and essentially more ornamental. The indispensable parts, therefore, rather than the trivial details, should be selected for generous expenditure in material.

THE YARD

It is difficult to think of yard and house separately, so closely is each related to the other. A well-planned and well-kept yard will greatly improve an ugly house; a pleasing house makes it far easier to lay out an attractive yard. On the other hand, a house with a poor yard, or none, is inhospitable and forlorn, and a yard without a house is meaningless. In planning either house or yard both must be kept in mind.

In planning new houses the place of the yard, as well as of roadways and barns, should be early decided on. At this time, too, one should arrange for easy going and coming between house and yard, keeping the house low to the ground and having doorways convenient to the lawn. One should plan to have the most attractive places in the borders opposite the most-used doorways and windows of the house.

If house and yard cannot be planned at the same time, as is the case where the house is already built, the yard will have to be made to suit it.

SEVEN KEYS TO ATTRACTIVENESS

If a person endeavors to think of places that have impressed him as being attractive, it may be difficult to recall just how these places were laid out. It is most likely that the impression was of an entirety rather than of component parts, such as an elm tree, some rose bushes, a garden seat, and a bed of petunias. In other words, such a scene was a picture, not merely a collection of objects. For this reason, in planning a yard, all that is done should give a positive answer to the question, "Will it make the home grounds look better as a whole scene?" To make such a picture, seven points should be emphasized:

1. The place must be well clothed, or furnished, with trees and shrubbery.
2. The house should be prominent and should have a good setting.
3. There must be an open space of lawn or sward.
4. The trees and the smaller plants should be massed or grouped at the sides or at the rear rather than scattered all over the place.
5. There must be no unnecessary fences, walks, or drives.
6. There must be no curiosities conspicuously placed in the yard, such as piles of stones, odd rocks, shells, pieces of statuary.
7. The place must be neat and well-kept so that it may look as if the residents gave it loving care.

PLANNING THE YARD IN DETAIL

Before being able to know definitely where and how to place trees and shrubs, it is necessary to analyze conditions in somewhat the following manner:

First, it is necessary to think of the house and the yard as they appear from points exterior to them. The view in from the highway should be kept in mind. Is the house the center of a picture, and does the planting in the yard give it an attractive background? If the trees overtop it somewhat from the rear in order to break up a too severe roof-line, if tree and shrub borders flank it on each side, and if the front is not wholly

FIG. 212. THE APPROACH TO THE HOUSE
The planting not only furnishes a background to the house but also frames the view of it

open but broken with some groups — then the planting not only furnishes a background to the house but also frames the view of it.

Second, the appearances of the yard must be studied from all the windows of the house and from doors and porches, for the outlook has an inspiring or depressing effect on those who dwell within, according to its beauty or ugliness.

OUTLOOKS

What objects should be borne in mind in studying the outlook? All that is seen may be divided into two groups: first, that which is beyond one's own yard or field and meadow, and belongs to another; second, that which one owns and can control. If the more distant views afford pleasing pictures, especially from convenient points, such as windows and porches

such outlooks should be left open in planting and not hidden by trees or shrubs. One may determine just what space in the border must not be planted by going to the window or the porch favored by the view, and may from there direct the placing of stakes to mark the extent of what is interesting in the distant view. The space up to the stakes may be planted, and the stakes removed. On the other hand, there are likely to be unsightly objects in the distant outlook, which should be carefully screened by plantings. One's own barnyard may be made pleasant, so that it will not need to be hidden.

FIG. 213. THE OUTLOOK SHOULD BE STUDIED
If distant views afford pleasing pictures such outlooks should be left open

In the immediate view of the yard the objects that should first receive attention are the necessary features, such as driveways, walks, barns, large trees, and lawn space. While these should be studied separately and individually, the relation of each part to the whole must not be lost sight of.

DRIVEWAYS AND WALKS

Of all the objects in the immediate outlook walks and driveways are most noticeable. Therefore, these should be as few as possible, and should be short and direct. Naturally a driveway should be so crowned and graded that it will not become muddy in wet weather, and the walks should be so paved that they will give dry footing. No matter how well a walk or a road is planned or constructed if its use is not plainly apparent, it is ridiculous.

Certain fixed points in the lines of roads and walks will determine the courses they must follow. These points are: the entrances from the highway, the doors of the house, and the location of barns and outbuildings. The routes that may be taken between such points are, however, somewhat subject to choice. The contour of the ground must be studied and also the positions of large fine trees that may seem to be in the way of road lines. Roads, especially, must have easy grades, and all these ways must be reasonably direct. Even so, roads and walks may have graceful lines and curves. When distances are short, straight lines are best; but where the terminal objects should be hidden, practicable curved lines may be contrived. While the route naturally taken from one place to another is usually a good basis on which to begin laying out walks and drives, modifications can be devised, which will smooth out inequalities of grade. Since the bare surfaces of roadways are always

in evidence in contrast with green grass, they should be laid out carefully and attractively.

Roads and walks are very conspicuous; therefore one must think of how they are to affect the lawn space over which or about which they pass. A lawn cut in two by a road appears scarcely larger than the greater portion. For this reason a drive is best kept to one side of the yard. To keep walks inconspicuous they may be made of large smooth stepping-stones placed at ordinary pacing intervals and level with the turf so that the lawn mower may pass over them. From a little distance the effect is that of an unbroken turf.

FIG. 214. A WALK OF STEPPING STONES
To keep walks inconspicuous they may be made of large smooth stepping stones placed at pacing intervals and level with the turf

The grades of walks and drives must be easy, not only for progress along them, but also to prevent their washing. They should be provided for first; therefore the grading of lawns is usually done after the walks and drives are made.

GRADING THE YARD

A few rules may be generally accepted for the grading of lawns. The ground about the house should be apparently level, though a slight slope away from the house is always allowed for drainage. The grades at the entrance to the yard should not be abrupt; if there must be some steepness, it had best be arranged somewhere between the entrance and the house. Most important of all are easy grades about the house, so that passage to and from house and yard may be almost as easy as from one room to another within the house. If there seem to be insurmountable difficulties in this regard, porches, covered or uncovered, or terraces may be built to serve as connections. A roundabout way, a high or steep flight of stairs, will deter the housewife from carrying work out under the trees, and will really prevent her going out as often as she should.

If the natural contour of the yard is comparatively flat, it is only necessary to smooth the surface. The usual method of cultivating will accom-

plish this, although some handwork may be necessary about the edges. The surface as it recedes from the house need not be smooth and perfect. A gently undulating surface may be desirable and by many persons is thought to be more interesting and country-like. A good test is whether the grassed surface may be readily cut with a hand mower. Perhaps the yard may be too large for its entire area to be hand-mowed; if this is the case, that part nearest the house, and which may be used as an outdoor sitting-room, should at least be kept trim. No matter how the turf is cut, the grades of the lawn will always be apparent, and the smoother the surface the more easy will be its care.

FIG. 215. EASY GRADES ARE IMPORTANT
Passage to and from house and yard should be almost as easy as from one room to another within the house

If slopes are needed on either side of walks or driveways, a strip of level surface two or three feet wide at least should parallel them, and from these levels the slopes should tend up or down by broad and easy curves. Further, the curve at the base of these — or, in fact, of any slope — should always be broader than at the top, so that the bank will be stable and will not appear top-heavy.

After all, a main consideration comes in the remarkably greater ease in caring for a yard that is well graded, and of which all rough banks have been changed to smooth turf and easily mowed slopes.

MAKING THE LAWN

The lawn is of foremost importance, and a good lawn is more beautiful than any other single feature. Neither shrubs, flowers, nor house will look well unless set off by lawn space.

The ground for a lawn should be prepared by the usual method of deep plowing and harrowing, or, on small areas spading and raking. Even on larger places it is necessary to use the spade and the rake about the edges and in corners. Where the soil is poor, it should be improved. To plow under a heavy turf, to grow and plow under one or more cover crops, or to work in barnyard manure at any time, will improve the soil to a good depth. The cover crops and the cultivation will also eliminate the weeds. If tile drains are necessary, they should be nearer together and closer to the surface than for field drainage. The grass will be as good as the preparation of the soil has been thorough, and there is no better way to combat weeds than by establishing a healthy and dense turf.

Any soil will be better for the addition of humus, which may come from

old turf, from barnyard manure, from green cover-crops, or from all three. No soil can be too well prepared; whereas some persons have attempted lawns on soil so poor and ill-prepared that it was not worthy of the grass seed needed to cover it. Lime will hasten the decay of organic matter and will correct a soil deficient in lime.

The surface should be as smooth before the seed is sown as it is expected to be when the lawn is finished. Therefore the raking should be supplemented by a thorough rolling before the final raking previous to seeding.

KINDS OF GRASS TO USE

If the soil is well prepared and is not sour, that is, deficient in lime, the same mixture of grass seed may be used at any season and in all places. It is best to buy " extra cleaned " seed and also to buy the various kinds separately and mix them at home. Equal quantities, by weight, of Kentucky bluegrass and redtop or Rhode Island bent should be used, estimating about sixteen pounds of the mixture to the bushel, and five bushels of seed to the acre. If the new lawns are to be soon used, it is advisable to add a peck of English or Italian rye. This is a coarse, quick-growing grass, but one that will die out gradually and not produce a harsh stubble or leave holes in the lawn in which weeds may start. If the seed must be sown late in the season, it is well to add to each bushel of the bluegrass and redtop mixture a quart of white clover. This starts quickly, is good for the soil, and, while acting as a nurse crop in protecting the new grass, it will later die out, probably leaving the Kentucky bluegrass and redtop to take possession. Since soils differ and various grasses have their preferences, sometimes one kind and sometimes another will take final possession.

It is best at the first seeding to sow only four of the five bushels of mixture allowed to the acre. This should be raked in carefully by hand in order to cover all seed to the depth of from one-eighth to one-quarter of an inch. Commercial fertilizers may be raked in just before seeding, but they should be thoroughly mixed with the soil. Sheep manure is not so cheap as the chemical fertilizers but has additional value as a surface mulch, especially on clay soils. Moreover, it contains no weed seeds.

After the seed has been sown, only a hand roller should be used. If this is not available, the rolling should be dispensed with, because a horse-drawn one gives a broken surface and holes are made by the horse's hoofs.

When the new grass is just long enough to cut, a sharp lawn-mower should be run over it; then over its entire surface should be scattered evenly the remaining bushel of seed of the five allowed to the acre, mixed with sufficient fine soil to make a layer one-eighth of an inch in depth. The lawn may be rolled again with a hand roller. The purpose of this

second seeding with accompaniment of soil is to deepen the roots of the first sowing and also to develop a denser turf. A larger proportion of seed and soil should be used on spots that have failed, or where, for any reason there is a poor stand. In fact, seed should be kept in a dry place all summer for sowing in the holes made by weeds, by temporary summer grass, and the like.

Constant care is necessary to make a good lawn, though when the lawn is fully established care may be given at odd moments. Neglect at the outset, however, will prove disastrous. A thrifty lawn is the best preparation against weeds.

PLANTINGS

PLANTINGS IN THE YARD

Shrubbery plantings serve various purposes. They may help correct unfortunate or unavoidable mistakes in plans and grades, or may serve as a frame for the whole grounds, or as screens for those portions that need to be hidden.

FIG. 216. BORDER PLANTINGS
Borders arranged to frame the lawn should be planted in rather solid masses

Just as slopes when in turf do not appear to be so steep as the same grade in a roadway, so a well-planted bank of shrubbery does not look so high or so abrupt as the same slope would in grass. Houses that appear to be too high from the ground may have this awkwardness somewhat relieved by a judicious use of shrubs or vines about the foundations. Slopes that are too steep to be easily maintained in grass should be planted with some growth that will completely cover them, and prevent their washing, and that will require no care as soon as the plants are established. The customary use of shrubs and vines to cover up unsightly places may be a misuse of them. The first aim should be to so improve the grounds that there is nothing to hide. Ofttimes there is an effort to hide features that are intrinsically good to look at. For example, a kitchen dooryard with its showy array of polished jars, pans, and implements of the kitchen

and dairy, is a significant mark of a country home, and should, by the thrift displayed, adorn that home. This yard may be paved with smooth stones, or with bricks, or both, but preferably with material that is on the farm. The paved space in the dooryards should be no larger than the space that is actually used, for weeds grow only in unused pavements. This outdoor kitchen should be furnished in accordance with its needs by means of racks, pegs on which to hang things, and benches of sturdy workmanship, made on the farm, rather than with cast-off furniture from the house or cheap benches from the store. There is nothing about such a dooryard that should be hidden by planting. A bracket or trellis over the door of the kitchen to support a canopy of flowering vines will, in fact, make a garden out of it.

FIG. 217. THE USE OF TREES
Three trees, more or less, so disposed about the house as to afford shade and to give the house its background and frame are all that are necessary

PLANTING ABOUT THE HOUSE

In arranging the planting about the house, in general, the less that is used to obtain an effect the better. Before any start is made, everything should be planned. Stakes with tops of various colors may represent the several shrubs and trees that have been determined on as suitable, and in this way the whole plan may be marked on the ground before a plant is ordered. While only a small part needs to be planted at a time, the whole effect should be borne in mind until it is secured.

In studying this effect, plantings must be considered not as they look when first set out, but as they will look when mature. For example, since lilac bushes grow to large size, each one should have plenty of space

to develop in, instead of the bushes being crowded in order to obtain a quicker effect. One bush will grow into better form if it is unhampered, though it may have one or more low-growing shrubs about its base. It is best to use individual bushes at the corners of the house (Figs. 210, 211, 217) or in groups about the porches rather than to plant an unbroken mass of shrubs all about the base of the house. A continuous fringe of plants is quite as monotonous as none at all.

Three trees, more or less, so disposed about the house as to afford shade and to give the house its background and frame, are all that are necessary. Elm, sugar maple, oak, or similar tall, strong trees are best; they afford shade without keeping air currents and light from the house. Poplar and silver maple give a quick effect because of their rapid growth, but they are brittle and short-lived, and should not be used.

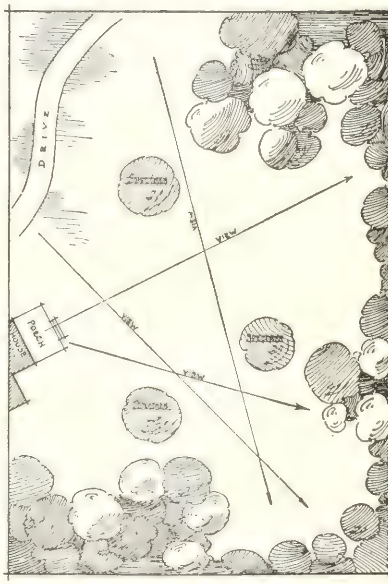


FIG. 218. A PLAN FOR BORDER PLANTINGS

The line of the border looks best as a series of bays or curved recesses. Opposite the important outlooks these bays should be deepest

PLANTING THE BORDERS

Between the plantings right next to the house and those on the borders of the yard there should be nothing but open unbroken lawn space. The lawn is needed to set off the planting, and a bordered lawn not only looks better but even larger than one not so enclosed.

The borders of trees and shrubs, arranged to frame the lawn and to encircle the outdoor sitting-rooms, should be planted in rather solid masses, much as nature fills in fence rows or hedgerows. Individual plants should be spaced so as to allow them to knit together as they mature. Slow-growing plants and large trees may be underplanted with temporary quick-growing material, which can be taken out later.

The line of the border looks best as a series of bays or curved recesses. Opposite the important outlooks from the house these bays should be deepest in order to give the greatest length of view. Borders may therefore be drawn farther away at such points, and brought nearer at others. These bays may enclose little areas of flower-bordered lawn or garden. Since too-marked curves may look unreasonable, the definite line of the border may be lost in scattered groups of large shrubs, or even trees, and such breaks will be the border's greatest charm.

Trees that have their branches low to the ground, such as beeches, hemlocks, field thorns (Cratægus), and lindens are suitable for border planting, and care should be taken to see that the low branches have not been trimmed off before the trees are set out. Such trees do not need any shrubs in front of them, and, in fact, nothing can be more beautiful than their own foliage spreading out on the ground. Many trees may be used in the borders of a large place, and they not only add informal charm and beauty but lessen the expense. Most trees and shrubs suited to border planting should be selected for their moderate-sized leaves, dark green foliage, and rounded or irregular habit of growth. Leaves persist longer than flowers; therefore foliage should be the deciding feature in the selection of plants. Shrubs of striking floral effect and trees or shrubs with accented points or spirelike growth should be at only a few widely separated places in the border, and also where they will be seen to advantage.

FIG. 219. INDIVIDUAL SPECIMENS SHOULD BE USED SPARINGLY

Shrubs of striking floral effect should be at only a few widely separated places

Many of the common shrubs may be gathered from hedgerow and brush lot and are the same as may be bought from the nurseries; they will not grow so fast the first year transplanted, but they have the advantage usually of being larger at the start, and they are assuredly hardy in their locality.

HOW TO MOVE TREES

Native trees that are not too subject to insects and diseases, for example, the locust and its borer, the chestnut and its canker, may be transplanted to the yard. This may be done by cutting the roots in the spring or early summer before the trees are to be moved, or, in other words, by root-pruning them. A tree from four to six inches in diameter should be root-pruned by means of a trench in which the roots are cut in a circle from eighteen inches to two feet from the base of the tree. This trench need not be more than eighteen inches deep and may be refilled immediately with the soil that came out of it. When the tree is to be moved, during the dormant period, or after growth has ceased in the fall, or before it has started in the spring, a larger circle is allowed to include the new

roots that have been formed. Care should be taken not to bruise the roots; but if any are badly bruised or marred, they should be cut off cleanly lest disease start in the injured portion. In replanting, the roots must be carefully spread out to their full length, and soil must be packed into every cavity and between all roots. This is handwork and the most important part of the operation of transplanting. While a carelessly planted tree may live, a well-planted tree is not only far more sure to live but to live thriftily and to flourish. Large shrubs are usually very hardy and will stand a lot of rough usage, but if transplanted carefully, they will grow faster and more symmetrically than if handled carelessly. It is best to stake trees until it is quite evident that they are firmly established. In all planting operations the ground should be well prepared, and generous holes made beforehand to fully accommodate the plants. After the soil has thoroughly settled and has been tamped in firmly, it should be covered with a mulch of straw, leaves, or other litter. The cultivation of such plantations is quite as important as the cultivation of the vegetable garden, for by such means the evaporation of moisture is prevented and healthy growth fostered. Only during the first two or three years, however, is this cultivation necessary; after that most trees and shrubs will grow unaided, except for such spraying or pruning as may occasionally be necessary.

FIG. 220. ONE OF THE GOOD VINES
The evergreen climbing evonymus should be more widely used

THE USE OF VINES

There are three ways in which vines may be used to great advantage; first, to cover walls, fences, or arbors; second, to cover, and thus to prevent the wash of steep banks; third, and most important, to drape and to adorn doorways.

No matter what vines are used about a yard, the best should be reserved to mark the entrances to the house and to festoon the porches. Bittersweet, Virginia creeper, trumpet creeper, and such old-fashioned vines are all good for walls and arbors. There are several others, however, such as the evergreen *Evonymus radicans*, or climbing evonymus, and *Actinidea arguta*, that should be more widely used.

To cover steep banks with vines is not only to save labor but to furnish very effective planting. Common honeysuckle (*Lonicera halliana*) accomplishes this very satisfactorily; matrimony vine (*Lycium chinense*) or bittersweet (*Celastrus scandens*) are equally satisfactory but give the effect of low shrubbery. Clematis and wistaria are familiar enough, but there are, in addition, many varieties of climbing roses of unquestioned hardiness and with summer flowers followed by showy fruit in fall and winter. Flowering vines should be used nearest the house, and the less conspicuous for walls and fences, so that the house will keep its prominence in the setting. A restricted use of vines on houses is always interesting, and in this use as well as on arbors grapevines not only furnish fruit, but are of peculiar beauty with their large and showy leaves, especially when the wind turns up the white undersurfaces.

FIG. 221. DRAPING THE DOORWAY
The most important use of vines is to adorn doorways

The tendency to use masonry rather than wood for house construction invites a greater use of vines. No plants more quickly take away the appearances of crudity and newness, more generously cover unattractive parts of awkward houses, or more effectively add grace and charm than vines. The stumps of dead trees should not be covered with vines but should be dug out with their roots.

GARDENS, OR PLACES FOR FAVORITE PLANTS

A garden is a private place. Therefore, the garden should be secluded, and thus may be free from the restraining considerations that are necessary to make the grounds look well as a whole. In the first place, gardens may occupy that portion of the outlook not taken up by a vista, or distant view; one does not seek to enjoy a garden and a view at the same time, for the one is close, and intimate, and personal, while the other is far away and shared by many. In the second place, gardens enclosed by shrub plantings or hedges are nearly hidden, and thus are more interesting to one who is within, and more alluring to one who sees them from without.

A garden is usually supposed to be a place for flowers, but it may also

be a place for plants in which one may be especially interested. The old-fashioned garden was a jumble of hardy shrubs, perennial garden flowers, and annuals. Those persons who are fond of the novelties of the nurseryman's catalog or of individual specimens for their peculiar characteristics, such as the color of their leaves, their distinctive habits of growth, their beauty, or their oddity, should have gardens into which all such plants may be gathered.

FIG. 222. AN ALLURING GARDEN GLIMPSE
Usually a garden has an enticing quality, which gives an inviting prospect for hours of rest

If a garden looks well as an entirety, it may be placed next to the house from which it will be enjoyed. If it is not attractive to many persons but merely interesting to its owner, it might better be tucked away into a secluded corner of the border. Usually the glimpse of a garden, distant across the lawn from the doorway, has an enticing or alluring quality, which gives an inviting prospect for hours of rest.

Successful flower gardens require more time than may be given ordinarily to farm yards, but the borders may be made to partly enclose corners of the lawn, which thus become outdoor rooms or, in fact, gardens, without adding to the cost or the care.

SUMMARY

No matter what the individual taste as to the home grounds, the total effect should always be kept in mind. It should be remembered also that the house is the center of the picture and the one object, if any, to be decorated. The lawns serve merely as a carpeted floor, or groundwork, on which are arranged the house and the trees and shrubs, which set it off. Borders furnish the frame to the lawn and to the whole picture; they should therefore be simple and dignified, and will look best if composed mostly of green foliage. This surrounding curtain of green, when it opens to a

FIG. 223. A GARDEN IS A PRIVATE PLACE
The garden should be secluded; one does not seek to enjoy a garden and a view at the same time

pleasant outlook over the fields, is also the best frame to the distant picture, and likewise serves as a background to increase the beauty of clumps of flowering shrubs along the edge of the border itself. The outlooks from the house should be planned to avoid any confusion of interests; in one direction one should see only unbroken lawn and distant border; in another, some shrubs, showy with flowers or berries; in another direction, an open view over the meadows; and perhaps, in still another, the suggestion of a garden or, fully as beautiful, a vista down the rows of an orchard.

Through these pictures the yard may be made more livable and homelike, and the country, of which the yard is a part, may be more enjoyed and appreciated as the ideal setting for a home.

A LIST OF TREES, SHRUBS, AND VINES FOR THE HOME GROUNDS

SHADE TREES SUITABLE FOR PLANTING ABOUT THE HOUSE

American elm (*Ulmus americana*)
Sugar maple (*Acer saccharum*)
Red oak (*Quercus rubra*)
White oak (*Quercus alba*)

SHADE TREES SUITABLE FOR BORDER PLANTATIONS

American beech (*Fagus ferruginea*)
European linden (*Tilia europæa*)
Hemlock (*Tsuga canadensis*)
Pin oak (*Quercus palustris*)
White oak (*Quercus alba*)
Scarlet oak (*Quercus coccinea*)
White pine (*Pinus strobus*)

SMALL TREES AND TALL SHRUBS FOR BORDERS

Field thorns (*Cratægus coccinea* and other species)
Flowering dogwood (*Cornus florida*)
Common privet (*Ligustrum vulgare*)
Fringe tree (*Chionanthus virginica*)
Sheepberry (*Viburnum lentago*)
Witch-hazel (*Hamamelis virginiana*)

GOOD FOLIAGE SHRUBS FOR BORDERS WITH FLOWERS NOT CONSPICUOUS

Arrowwood (*Viburnum dentatum*), white flowers, blue berries
Indian currant, coralberry (*Symphoricarpos vulgaris*), red berries

Hazel (*Corylus americana*)
Siberian dogwood (*Cornus alba* var. *sibirica*)
Regel's privet (*Ligustrum ibota* var. *regelianum*)

SHRUBS FOR BORDERS WITH CONSPICUOUS FLOWERS OR FRUIT

Althæa, rose of Sharon (*Hibiscus syriacus*)
Common barberry (*Berberis vulgaris*)
Japanese barberry (*Berberis thunbergii*)
Tartarian honeysuckle (*Lonicera tatarica*)
Fragrant honeysuckle (*Lonicera fragrantissima*), semievergreen
Syringa (*Philadelphus latifolius*), tall
Syringa (*Philadelphus coronarius*), sweet scented
Syringa (*Philadelphus lemoinei*), dwarf
Van Houtte's spiræa (*Spiræa vanhouttei*)
Snowball (*Viburnum tomentosum*)

SHRUBS SUITABLE FOR USE AS INDIVIDUALS AT HOUSE CORNERS AND PORCHES

Lilac (Syringa). Various types have been developed in shades of blue, reddish, and white. A selection of these will give a prolonged flowering season.
Tartarian honeysuckle (*Lonicera tatarica*)
Common privet (*Ligustrum vulgare*), semievergreen
Regel's privet (*Ligustrum ibota* var. *regelianum*), low
Van Houtte's spiræa (*Spiræa vanhouttei*)
Japanese barberry (*Berberis thunbergii*)
Arrowwood (*Viburnum dentatum*)

VINES FOR DOORWAYS AND ARBORS

Rose
  Dorothy Perkins
  Tausendschön
  Alberic Barbier
  Hiawatha
Japanese clematis (*Clematis paniculata*), white
Jackman's clematis (*Clematis jackmannii*), blue, large-flowered
Wistaria, blue or white
Evonymus (*Evonymus radicans* var. *vegeta*), evergreen

VINES FOR WALLS

Boston ivy, Japanese ivy (*Ampelopsis veitchii*)
Virginia creeper (*Ampelopsis quinquefolia*)
Chinese matrimony vine (*Lycium chinense*)

Trumpet creeper (*Tecoma radicans*)

Climbing bittersweet (*Celastrus scandens*). This does well also on shady sides of houses.

VINES FOR STEEP BANKS

Hall's honeysuckle (*Lonicera halliana*)

Matrimony vine (*Lycium chinense*)

CORNELL STUDY CLUBS

At the close of the harvest season neighbors and friends find it natural and convenient to visit together during the lengthening evenings and talk over the common experiences of the passing season. The Cornell study club begins to feel that the time is at hand to arrange plans for the year's study and for community advancement — educationally, socially, and financially. It is often helpful during the fall to hold a special meeting, invite every one in the community to attend, and see that each one has an enjoyable and profitable time. A successful meeting, largely attended, provides an opportunity to increase the membership and secure greater interest in the work of the club. Although material for the programs for Cornell study clubs is generally supplied by local speakers and by reading course lessons, it may be advisable to get an outside speaker if possible for the special meeting. The Supervisor of the Reading Course for the Farm, College of Agriculture, Ithaca, New York, will be glad to cooperate with clubs as far as possible in arranging the programs for special fall meetings.

The fall of the year is also the most favorable time for forming new clubs. For the information of readers who are not members of clubs, the aims and advantages of Cornell study clubs are given as follows:

Cornell study clubs aim to promote the study of reading course lessons, and also to advance the welfare of the local community. A study club furnishes an opportunity and incentive for study. Often a helpful lesson will reach a farm home at a time when it cannot be given attention, and it is set aside, soon to be forgotten. If, however, a special time is reserved for the study of reading course lessons at a club, it is likely that much more reading will be accomplished. The club serves the community socially through the better understanding and good feeling among neighbors that result from an association in a common work. By promoting exchanges and sales of farm products, implements, stock, and the like, between the members of the club, and by collective buying and selling, it may be found possible for the club to be of financial benefit to the members.

Information on the steps to be taken in organizing a Cornell study club will be sent on request. Also, it may be possible for the Supervisor of the Reading Course for the Farm to arrange a visit to a community that desires to organize a new club.

AVAILABLE READING COURSE LESSONS FOR THE FARM, ARRANGED BY SERIES

Residents of New York State may register for one or more of the series mentioned below by addressing The Cornell Reading Course for the Farm, College of Agriculture, Ithaca, New York.

SERIES		LESSONS
The soil	74	Introduction to the principles of soil fertility
	42	Tilth and tillage of the soil
	50	Nature, effects, and maintenance of humus in the soil
	70	Soil moisture and crop production
	78	Land drainage and soil efficiency
Poultry	80	Incubation
	88	Feeding young chickens
Farm forestry	12	The improvement of the woodlot
	28	Recent New York State Laws giving relief from taxation on lands used for forestry purposes
	40	County, town, and village forests
	62	Methods of determining the value of timber in the farm woodlot
The horse	46	Feeding and care of the horse
	56	Practical horse-breeding
Dairying	16	Practical dairy problems.
	32	Composition of milk and some of its products
	54	The dairy herd
	60	Farm butter-making
	82	Cream separation
	86	The production of clean milk
Fruit growing	22	The culture of the currant and the gooseberry
	36	Culture of red and black raspberries and of purple-cane varieties
	48	Culture of the cherry
	52	Culture of the blackberry
	72	Culture of the grape

The above list is correct to September 15, 1915. The demand may at any time exhaust the supply of particular numbers. Requests will be filled as long as the supply lasts.

SUPPLEMENT TO

The Cornell Reading Courses

PUBLISHED BY THE

NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

BEVERLY T. GALLOWAY, *Dean*

COURSE FOR THE FARM, ROYAL GILKEY, Supervisor

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

VOL. IV. No. 96 SEPTEMBER 15, 1915 COUNTRY LIFE SERIES No. 4

THE SURROUNDINGS OF THE FARM HOME

DISCUSSION PAPER

A discussion paper is sent with each reading course lesson in order to assist the reader in studying the most important points. The discussion paper also encourages thought, observation, and self-expression. Each discussion paper filled out and returned will be read carefully, and a personal reply will be made if further information or references for advanced reading are desired. Practical suggestions on farm problems will be sent gladly.

New readers should enroll in one or more of the following series of reading course lessons: THE SOIL, POULTRY, RURAL ENGINEERING, FARM FORESTRY, THE HORSE, DAIRYING, FRUIT GROWING, FARM CROPS, STOCK FEEDING, VEGETABLE GARDENING, PLANT BREEDING, INSECT, COUNTRY LIFE. The first lesson in each series desired is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. *Therefore, in order to receive the other lessons in this series, readers should sign and return this discussion paper, whether the questions are answered or not.* By means of reading course lessons, study clubs may be promoted, which may become important factors in community welfare. Assistance will be given in organizing and conducting clubs. *The space below on this page is reserved for correspondence concerning reading course work, and also for names and addresses of any residents of New York State likely to become interested in the Cornell Reading Course for the Farm.*

(In answering questions, attach additional paper if needed and number the answers.)

1. How can a yard furnish a good setting for the house from the point of view of the highway?

2. Why is it necessary to take great care in laying out driveways and walks?

3. In what part of the border plantations is it best to have conspicuous shrubs and trees, and in what part is it best to have shrubs and trees that are not in any way conspicuous?

4. What are the most successful shrubs in your locality?

5. What shrubs, otherwise desirable, have been found, after trial, not hardy enough for your neighborhood?

6. What are the standard grass seeds for well-prepared lawns, and when is it best to add white clover to the mixture and when perennial rye?

7. Have you had any experience with lawn grasses other than bluegrass, redtop, and white clover? Have other kinds proved permanently useful?

8. What trees and shrubs native to your region lend themselves particularly to home planting; and why?

9. Where can individual plants of unusual character be placed so as not to spoil the effect of the yard as a whole?

10. Where should the most attractive flowering vines be planted?

Name...

Address..

Date...

(*Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.*)

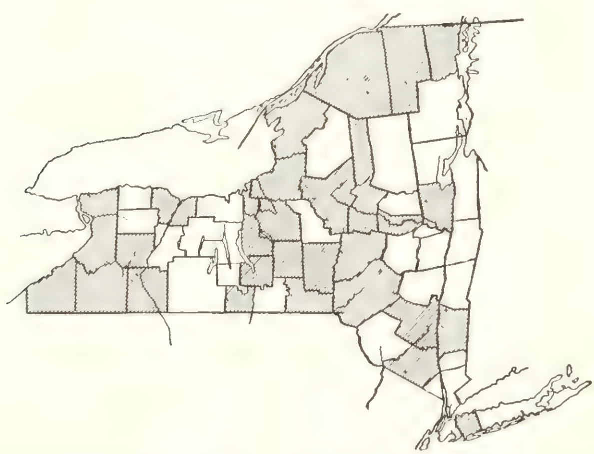
CIRCULAR No. 5 MARCH, 1915

Farm Bureaus of New York State

NEW YORK STATE COLLEGE OF AGRICULTURE, NEW YORK STATE DEPARTMENT OF AGRICULTURE, UNITED STATES DEPARTMENT OF AGRICULTURE, COOPERATING

NIAGARA COUNTY: AN ACCOUNT OF ITS AGRICULTURE AND OF ITS FARM BUREAU

By E. H. ANDERSON
Manager of Niagara County Farm Bureau



The darkened areas show the counties in which farm bureaus had been organized up to March, 1915

UNDER THE DIRECTION OF
M. C. BURRITT
STATE DIRECTOR OF FARM BUREAUS

ITHACA, NEW YORK
PUBLISHED BY THE UNIVERSITY

PREFACE

At the present time there is very little complete and specific information concerning the history and status of agriculture in the various counties of New York State, written in popular language and available to the general public. In the belief that such information is wanted both by the residents of the county itself and by persons living outside the county but interested in it, and that the publication of a reconnaissance survey of local agricultural facts and conditions in each county will do much to arouse local pride, to call attention to local problems, and to make known the agricultural advantages and opportunities in a county, a series of circulars has been projected.

It is expected that each of these circulars, written by the local county farm bureau manager under the general direction of the central office, will present a fairly complete statement of the agricultural conditions and possibilities of a county. Besides a brief history of agriculture in a county, each circular will include a description of the local climate, soil, and topography, a statement of population, general business conditions, market facilities, types of farming practiced, and tables showing total production and unit yields. Desirable systems of farm management will also be pointed out, suggestions will be made, and attention will be called to many important matters on which success in farming depends locally.

The second part of each of these circulars will be an account of the local farm bureau, its organization, and its ability to help in developing local agriculture. Some of the most important functions of a farm bureau association are: the study of local problems with the purpose of finding solutions for them; presenting to the general public in an attractive manner the opportunities for farming in the county; and stimulating local initiative. To increase the net incomes of farmers, thus providing the means of obtaining better schools, churches, and roads, is to promote the welfare of every citizen in the county. Such cooperative effort, properly directed, should also result in a material increase in land values. All these things, the parties cooperating in the farm bureau work in New York State desire to promote. This publication, it is thought, will aid the proposed work.

Niagara was the seventh county in New York State to organize a farm bureau. The work was begun before the general public understood it well enough to be generally in favor of it and to give it good support. Both for this reason and because the greater part of the county is already well developed agriculturally, the work of the farm bureau has been difficult from the start. It has, however, been well worth while. Niagara is one of the richest and best-farmed counties in the State, and the publication in popular form of the facts about its agriculture should be of great interest and value.

M. C. BURRITT,
Director of Farm Bureaus.

NIAGARA COUNTY: AN ACCOUNT OF ITS AGRICULTURE AND OF ITS FARM BUREAU

PART I

THE AGRICULTURE OF NIAGARA COUNTY[1]

" Niagara " is a name known around the world, calling to mind one of the greatest of waterfalls. The territory adjacent to the river has its Indian traditions and its history of Indian, French, and British strife. The French visited it first in 1626 and found it to be a valuable center for the fur trade, for at that time the Indians were using the Great Lakes, with a portage at the falls, as their trading route to the French fort at Quebec. Some fifty years later La Salle began the building of forts and trading houses along the Niagara River. In 1718 a French writer spoke of the country thus:

" The Niagara Portage is two leagues and a half to three leagues long, but the road over which carts roll two or three times a year, is very fine, with very beautiful and open woods through which a person is visible for a distance of six hundred paces. The trees are all oaks and very large. The soil along the whole of that road is not very good. Above the first hill there is a Seneca village of about ten cabins, where Indian corn, beans, peas, and watermelons and pumpkins are raised, all of which are very fine."

This region was coveted by the British, and in 1759 they captured it. The British held it until 1796, when it became the property of the United States.

The early history of Niagara is one of warfare and of Indian trading. Even when it was under French control, it was claimed by both Massachusetts and New York; and later, although it was under British control, New York claimed it and considered it a part of several different counties. Not until 1821 was Niagara County erected with its present boundaries, about eighteen miles north and south by thirty miles east and west, and in its present rectangular shape. It is bounded on the north by Lake Ontario, on the east by Orleans and Genesee Counties, on the south by Erie County and the Niagara River, and on the west by the Niagara River. It has an area of five hundred and twenty-two square miles.

While the territory embraced by the boundaries of Niagara County was among the first in the States bordering on the Great Lakes to be visited by white men, its settlement did not commence in earnest until the beginning of the nineteenth century. The greater part of the population, prior to 1800, was connected with the garrisons, and no definite attempt to follow agriculture was made. In 1800, when the first tax roll for land west of the Genesee River was made out, there was not a single taxable person within the boundaries of the present Niagara County.

In 1802 the first agricultural settlement was made on the lake shore near Fort Niagara (Fig. 2, page 2085). From 1802 to 1812 many settlements were

[1] Some of the historical data used in this circular are taken from *Soil Survey of Niagara County, New York*, published by the United States Bureau of Soils.

made in the drier portion of the county; these were on the lake shore, the Ridge Road, and the Mountain Ridge, and along the Niagara River. Some settlements were also made near Tonawanda Creek. Much of the county was said to be open ponds in the early days, and the excessively marshy condition of the lowlands defied subjection.

A well-traveled trail of the Iroquois from the Hudson to the Niagara, leading through Canandaigua and Batavia, emerged from the Tonawanda Swamp nearly southeast of the present Royalton Center, followed Chestnut Ridge to Cold Springs, ran thence to Warren's Corners, and from there along the Ridge past Hopkins' Marsh through the Tuscarora village to the Niagara River. About 1800 this trail was improved so that sleighs could traverse it in winter. This was the first road laid out north of the main road from Canandaigua to Buffalo.

The completion of the Erie Canal, in 1825, gave a great impetus to settlement in the county (Fig. 1). It provided a ready means of transportation, and it stimulated industry. This influence is well shown by the growth of the village of Lockport, which in 1820 had a population of 100, in 1830 had increased to 2100, and in 1840 had increased to 6088. The population of the townships along the canal developed proportionately. The crops grown were those that could be easily shipped by canal.

Farmers' organizations.—Three agricultural organizations have done much toward developing the agriculture of the county: the Niagara County Farmers' Club, the County Agricultural Society, and the local granges. A large number of the most progressive farmers are members of one or all of these organizations.

For the past sixty years there has at various times existed in this county what has been called the Niagara County Farmers' Club, though the present organization dates back only to 1880. By its monthly meetings at different points in the county, this organization has exerted a strong influence in both an agricultural and a political way. At these meetings an address is given by a person of authority on some phase of agriculture, and the discussion always includes timely subjects of importance to the farmers of the county. The club has a dual purpose: it endeavors to better agricultural conditions in the county, and to develop the social side of farm life by furnishing a means whereby the farmers may meet and become acquainted.

A county agricultural society was informally organized in 1841. The first fair was held that year at Lockport, subsequent ones being held in most of the towns of the county. The present agricultural society was formed by the reorganization of the old one in 1858.

The grange in Niagara County is of comparatively recent origin, many of the local organizations having charters but a few years old. By the bringing together of farmers of the same section, the grange has been a strong factor in developing local pride and initiative. Many movements for agricultural betterment have originated with or have received encouragement by the grange, among which may be mentioned the purchase of fertilizers and farm supplies and the formation of cooperative associations for marketing fruit. While the grange is mindful of the farmers' financial welfare, it has also been a strong influence toward

improving farm home conditions and toward increasing social opportunities in the county.

CONDITIONS THAT LIMIT AGRICULTURE

Climate, topography, and soil are the three important factors in determining crop adaptation. The proper fitting of crops to them opens the way to successful farming.

Climate

The annual precipitation is a little over thirty-two inches, one-half of which falls in the five months from May to September, inclusive.

The average date of the last killing frost in spring is in the last four days in April, and the first killing frost in the fall occurs about the sixteenth of October. This gives a growing season of over one hundred and seventy days.

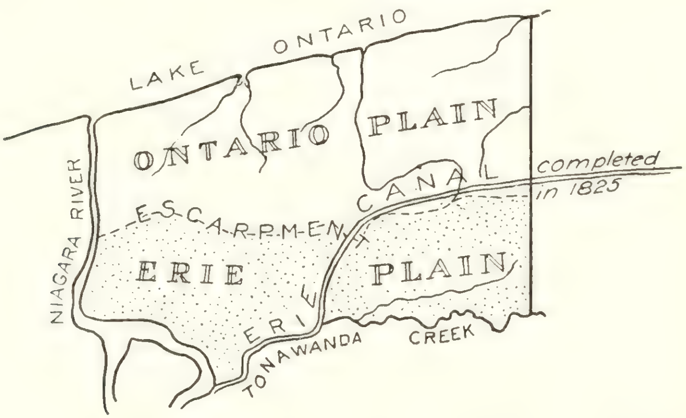


FIG. 1.— *Niagara County, showing the physical features of the land and the Erie Canal. The Ontario Plain is devoted chiefly to fruit growing, while the Erie Plain is given up to hay and grain raising*

The mean temperature in Niagara County is about 47.5° F. The maximum temperature recorded is 99° F., and the minimum is —16° F., recorded at Lockport in the winter of 1914. Southwest, west, northwest, north, and northeast winds pass over water before reaching this county, thus modifying the temperature and checking frosts.

Topography and soils

Niagara County is divided by nature into two plains, the Ontario Plain and the Erie Plain. The Ontario, or lower, Plain is the northern two-thirds of the county. It slopes gradually toward Lake Ontario from the abrupt escarpment that divides the two plains and that passes through Lockport. The elevation of the Ontario Plain at Appleton, two miles from Lake Ontario, is 340 feet above sea level and 80 feet above the level

of Lake Ontario. The Erie, or upper, Plain is the southern third of the county. The elevation of the Erie Plain at Lockport, twelve miles from Lake Ontario, is 620 feet above sea level and 360 feet above the level of Lake Ontario. The Niagara River, flowing north from the Erie Plain to the Ontario Plain over the abrupt escarpment, makes the world-famed Niagara Falls.

The division into the two plains rather generally divides the agricultural interests and the adaptability of the county. The southern plain, being generally level and poorly drained, is devoted largely to general farming, with hay and grain as the leading crops and with some good orchards on the higher parts. The northern plain is devoted to fruit growing and general farming near the escarpment, while toward Lake Ontario, because of the ameliorating influence of the water, it is given over almost exclusively to the growing of fruits — peaches, apples, pears, and cherries. The area bordering the lake is devoted largely to peaches; here are found not only some of the largest and most productive peach orchards in the State, but also probably the oldest, showing the natural adaptation of this part of Niagara County to the production of this popular fruit. The quality of fruit grown in Niagara County has long been known. "The fruit raised on the level reaches of Niagara orchard land is of fine quality; and connoisseurs assert that they can select it from among that of other localities by its peculiar richness," says a history written forty years ago.

Glaciers and glacial lakes have been the principal factors in forming the soils of Niagara County. Consequently the soils bear little resemblance to the rocks beneath. These rock formations are shales, sandstones, and limestones, and have a gradual slope toward the south. The soil overlying these rock formations varies in thickness from a few inches along the escarpment, where the edges of the rock strata may frequently be seen, to thirty or forty feet at various points on the plains.

Most of the soils of the county, except the Tonawanda loam, belong to the Dunkirk and the Clyde series. Across the southern third of the county, the heavy clay soils prevail; along the escarpment, both to the north and the south, are silt loam, clay loam, and sandy and gravelly loam; north of these, the heavier Clyde loam is the commonest; and along the lake shores are the lighter Dunkirk loams.

Draining some parts of the county has been, and is, the great problem. Owing to the comparatively level topography and the heavy soil structure of the southern part of the county, surface water is carried off very slowly, and artificial drainage is necessary for this entire area. This is usually accomplished by a series of parallel ditches, which are opened after the fields have been prepared for crops.

When the early settlers came into the southern part of the county, they found almost a sea of water and swamp surrounding Beech and Bear Ridges. From 1860 to 1870 a system of ditches was dug for the purpose of draining the lowlands. These ditches brought into tillage many acres that had been swamp. However, there is a need for still better systems of drainage in order to carry off the floods that occur during the spring. At this time fields that have been seeded to wheat, and those that must be plowed for oats, stand for days under water.

Marketing advantages

Niagara County is favorably located for shipping its products. Fruit may reach the New York market within forty-eight hours, and the Chicago market within about the same time. At shipping points there are a large number of storage buildings of the types used for both common and cold storage. Both the Ontario Division and the Falls Road branch of the New York Central Railroad run the length of the county (Fig. 2). Thirty freight trains go through Niagara County on the tracks of the New York Central Railroad each day. A branch of the Erie Railroad and three electric roads add to the shipping facilities. An automobile express service runs daily between points in the county on the Ridge Road and Buffalo. Gardeners in the western part of the county are within driving distance of Buffalo.

Electric power derived from Niagara Falls is in great demand, and consequently within Niagara County itself there are three manufacturing

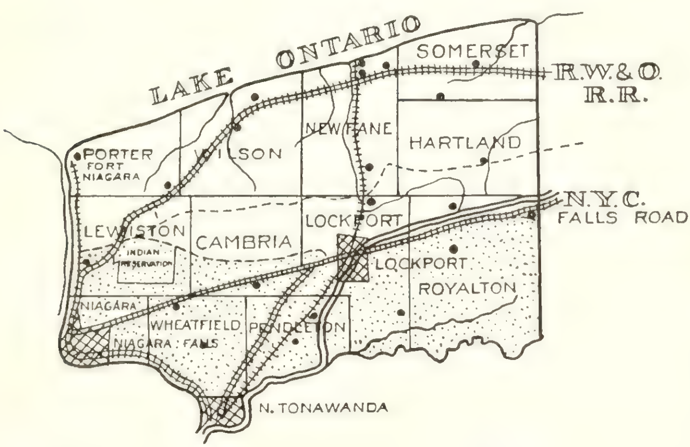


FIG. 2.— *Niagara County at the present time, showing the location of railroads and townships*

cities having some three hundred and fifty establishments, which engage 13,000 persons. These three cities have a total population of about 70,000. Not only do these cities furnish excellent local markets, but their manufacturing establishments demand good railroad service for the county.

PRESENT STATUS OF AGRICULTURE

Niagara County has 4346 farms, covering an area of over 305,800 acres, of which 92.5 per cent was reported as improved land in 1910. This was a larger percentage of improved land than was reported by any other county in the State. The average size of the farms of Niagara County is 70.4 acres, with 65.1 acres of improved land. The average value of all property per farm is $9127.

TABLE 1.— NUMBER AND SIZE OF FARMS, ACCORDING TO THE CENSUS OF 1910

Number of farms	Size of farms	Percentage of total number of farms
824	Less than 20 acres	18.9
838	20 to 49 acres	19.3
1,531	50 to 99 acres	35.2
945	100 to 175 acres	21.7
208	More than 175 acres	4.8

TABLE 2.— DISTRIBUTION OF ALL FARM PROPERTY, ACCORDING TO THE CENSUS OF 1910

Year	Value of all farm property	Land	Buildings	Machinery and implements	Domestic animals, poultry, bees, and the like
1900	$23,472,530	$13,959,900	$ 6,636,980	$ 786,065	$2,089,585
1910	39,665,809	22,889,971	11,101,340	2,153,604	3,520,894
Percentage of value of all farm property in 1910		57.7	28.0	5.4	8.9

Location in regard to markets, drainage, and development, influences the value of the land in different parts of the county. Land on which there was a large bearing orchard is reported to have sold for $1000 per acre; entire farms in the fruit belt for from $150 to $500 per acre, depending on location and development; and the heavier, more level, general farming land for from $75 to $150 per acre, depending on the same two conditions.

TABLE 3.— NUMBER OF DOMESTIC ANIMALS, ACCORDING TO THE CENSUS OF 1910

	Horses	Dairy cows	Sheep	Swine	Poultry
Total number in 1900	14,585	13,181	37,165	17,110	228,471
Total number in 1910	15,510	13,058	28,241	17,502	261,290
Average number per farm in 1910	3.6	3.0	6.5	4.0	60.1

The first crops grown were such as met the simple needs of the family. In 1840 the leading crops in their order were wheat, potatoes, oats, corn, barley, buckwheat, peas, beans, and flax.

An important industry was the production of "black ash salts" and the reduction of potash from the surplus timber, this frequently bringing in the first money of the settlers. The production of cranberries at this time also yielded some revenue.

Wheatfield, the name of one of the southern townships of Niagara County, suggests the first great crop raised on that newly cleared land. It is said that in 1825 Harvey Miller chopped and cleared eighteen acres of land and harvested eight hundred bushels of wheat from this land the following year — an average of forty-four bushels per acre. This he sold for seventy-five cents per bushel to the incoming settlers, the one crop more than paying for his claim of one hundred acres.

Stock raising was largely engaged in until about 1875, when western competition became severe. Grain farming continued the mainstay of the farmers as late as 1880. Hay has always been the most important crop as far as acreage is concerned.

Fruit growing.— Apple trees have always been associated with Niagara County. It is claimed that the Tuscarora Indians had over fifteen hundred fruit trees before the white man made any attempt at an agricultural settlement in this county. Among the seeds that the first settlers brought in from the East were those of the apple. Early varieties raised were Esopus (Spitzenberg), Yellow Newtown (Newtown Pippin), Fall Pippin, Tolman (Talman Sweet), Rambo, Yellow Bellflower, and Rhode Island Greening. Varieties raised for cider making were the most profitable. Years later these trees were grafted to the marketable varieties of to-day — Baldwin, Northern Spy, Rhode Island Greening, and others.

In 1813 Jarius Rose, living near Sanborn, sowed two acres of land to apple seeds, thus starting the first nursery in the county. The young trees were distributed throughout the county, selling for twelve cents each. The years 1825 to 1850 are called the early apple-planting period. Many of these seedlings were top-grafted. These trees came into bearing between 1845 and 1860 and produced a surplus of fruit. In 1860 in Hartland and Royalton alone there were sold 16,000 barrels of fruit. In 1878 there were said to be 1,400,000 apple trees in Niagara County (History of Niagara County); in 1909 there were only 804,155 (United States Census).

The cultivation of apples having started fruit culture, peaches and pears were introduced next, and the planting of plums and other fruits was begun about 1875.

The influence of Jarius Rose on the subsequent orchard development of the county was indeed great. However, there is a man still living, a practical horticulturist, farmer, and writer, whose influence on the farmers and fruit growers, not only of Niagara County but of the entire State of New York as well, has been even greater. This man is J. S. Woodward, of Lockport, who has been a resident of Niagara County for over eighty years. He has been the most progressive farmer of the county during the past half century. He has had many honors and duties in connection with agricultural work. He was the Secretary and Manager of the New York State Agricultural Society for five years; he organized the farmers' institutes of the State of New York; and with him

have originated many agricultural practices that were at first received by the public with criticisms, only to be enthusiastically adopted later, after trial. He was the first man to recommend the winter shearing of feeding sheep and the close housing of milch cows and fattening animals in warm stables. He was also the first in New York State to bring to the attention of the public and to recommend the spraying of apple trees with poison for the destruction of the codling moth, a practice that is now world-wide and is the means of saving millions of dollars to the fruit grower every year.

It would be strange, in a county where fruit growing is so highly developed, if new varieties were not originated. Best known among the varieties that have originated in Niagara County are the Niagara grape, the Niagara peach, and the Pomeroy English walnut.

The Niagara grape originated in 1872. The original vine still stands on the grounds of the Odd Fellows' Home in Lockport. This grape has proved more valuable than any other white American grape, and has attained a popularity that has extended wherever grapes are known.

The Niagara peach, well known among all peach growers of western New York, was developed at Corwin Station, on the farm of the late P. H. Corwin. In 1894 Mr. Corwin began propagating it as a new variety. Under favorable conditions the fruit is large, and the variety is an important addition to the varieties of peaches for this region.

The Pomeroy English walnut originated on the farm of the late Norman Pomeroy from nuts brought to him from Philadelphia in 1876. The original trees still stand on the farm known as the English Walnut Farm, west of Lockport. The trees have proved hardy and productive, and stock raised from nuts grown on the original trees has been widely distributed for orchard and ornamental planting.

TABLE 4.— THE RANK OF NIAGARA COUNTY AMONG THE COUNTIES OF NEW YORK STATE IN THE PRODUCTION OF IMPORTANT CROPS, ACCORDING TO THE CENSUS OF 1910

	Rank	Percentage of total production for New York State
Fruit trees, number	First	11.7
Fruit produced, number of bushels	Second	11.5
Peaches, number of bushels	First	32.3
Pears, number of bushels	First	16.1
Plums and prunes, number of bushels	First	26.8
Quinces, number of bushels	First	42.3
Cherries, number of bushels	First	10.6
Apples, number of bushels	Third	9.3
Wheat, number of acres	Third	9.2
Wheat, number of bushels	Third	8.6
Corn, number of bushels	Sixth	4.0

In 1910 Niagara County led all the other counties of the State, except Wayne, in the number of bushels of orchard fruits produced; it was first

FIG. 3.—*Apples produced in 1909: State of Washington, 2,672,100 bushels; Niagara County, 2,366,600 bushels; State of Oregon, 1,930,926 bushels*

in the production of peaches, pears, plums and prunes, cherries, and quinces; and it was third in the production of apples.

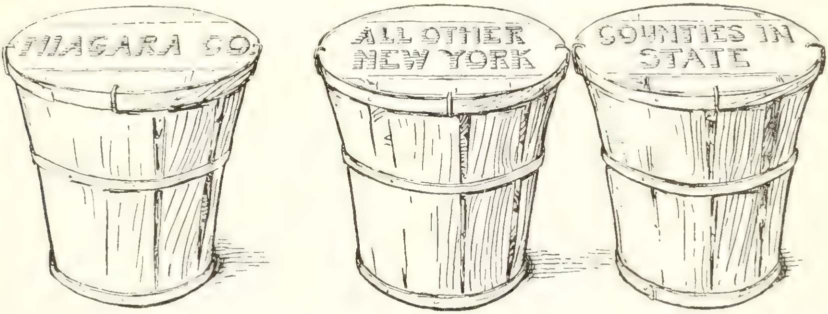


FIG. 4.—*Peaches produced in 1909. The total for New York State was 1,736,483 bushels, of which Niagara County produced 561,439 bushels, or nearly one-third*

Niagara County produces almost one-third of all the peaches grown in New York, and about one-third as many as are produced in Georgia.

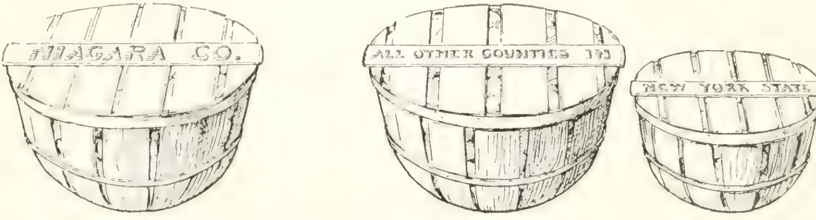


FIG. 5.—*Quinces produced in 1909. The total for New York State was 132,451 bushels, of which Niagara County produced 56,124 bushels*

More than one-fourth of the supply of plums and prunes produced in the State are grown in this county. The townships of Somerset and New-

fane each produce annually more fruit than is grown in the far-famed Hood River Valley.

During the season of 1912, there were shipped from Niagara County over the New York Central and Hudson River Railroad and the International Railroad more than 5822 carloads of apples and 1494 carloads of peaches and plums, making a total of 7316 carloads of apples, peaches, and plums. To this must be added many carloads of apples, peaches, pears, plums, cherries, and grapes that were shipped by express in small lots and sold either in the markets of Buffalo, Niagara Falls, Lockport, and North Tonawanda or to Canadian dealers and shipped by boat or delivered via Suspension Bridge. The amount of fruit handled in this way can only be estimated, but it is undoubtedly great.

While fruit growing is conceded to be the most important agricultural industry of the county, the value of the cereals, the hay, and the forage produced nearly equals that of the fruits. It has been stated that in 1840 the leading crops in their order were wheat, potatoes, oats, corn, barley, buckwheat, peas, beans, and flax; and that grain farming was the mainstay of the farmers as late as 1880.

At present, judging by the acreage devoted to each, the leading field crops in order are hay, oats, wheat, corn, potatoes, beans, buckwheat, rye, and barley.

From the standpoint of acreage, hay stands first with its 67,500 acres, yielding 82,500 tons. Every year one-fifth of the farm area of the county is bearing a hay crop.

For more than the first half of the last century, wheat was the principal crop sold, the number of bushels of wheat exceeding that of orchard fruits. In 1870 the census reported 961,303 bushels of wheat grown in this county, the greatest number ever reported. In the last thirty years, the acreage devoted to wheat has decreased from 46,500 acres to 26,500 acres, and the yield from 866,531 bushels to 577,082 bushels. However, the yield per acre has increased from 18 bushels to 21 bushels.

Oats are raised chiefly for feed. As the number of horses required has increased, the oat crop has been increased to feed them.

Barley reached the height of its production in 1880 with 22,700 acres, yielding 495,000 bushels. From that time it has declined steadily and rapidly, until now there are only between one and two thousand acres sown to barley in a year.

Corn is raised for feed, and for that reason the amount produced from year to year has been very uniform. Its production has not fallen off as has the production of wheat and barley.

In 1840 potatoes were the second crop in importance in the county. The yield was 288,692 bushels. This crop has continued to be an important one, and its increase in acreage and yield has been steady, until now there are about seven thousand acres devoted to potato growing.

In number of acres planted, beans follow potatoes closely. The production of this crop has increased slowly in the last fifty years.

About one thousand or more acres are devoted to the production of rye and buckwheat, respectively.

Table 5 gives the acreage and the yield of these general crops for Niagara County, together with the average yield for New York State:

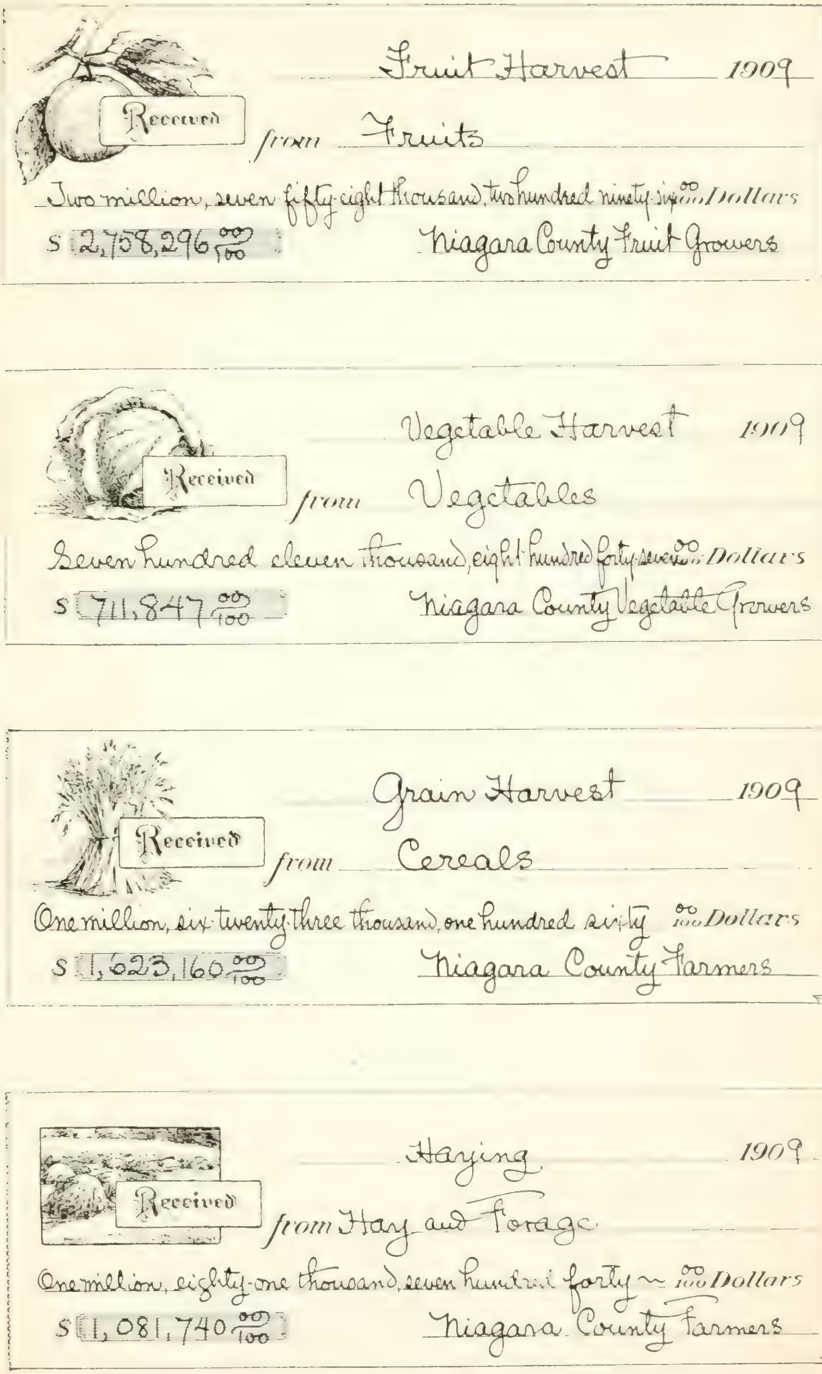


FIG. 6.— *The relative value of fruit and other crops, shown graphically*

Fig. 7.—*In the heart of the fruit-growing region near Lewiston, Niagara County, looking north from the "Ridge." The grapes in the foreground are not so characteristic of the county as are the peach, the apple, and the plum trees in the distance*

FIG. 8.— *In an apple orchard in Niagara County at picking time. Niagara produced more apples in 1909 than any other county in the United States, except Wayne County, New York*

FIG. 9.—*A crop of oats on the level, heavier soil of the Erie Plain, in the southern part of Niagara County. This area is better adapted to growing grain and hay than for fruit*

FIG. 10.—*A corner of an apple orchard deficient in drainage in the mixed farming region in Niagara County. A lack of good surface and tile drainage is characteristic of many parts of the county*

TABLE 5.— Acreage and Yield of Principal Farm Crops, According to the Census of 1910

	Acres	Total yield	Yield per acre	Average yield per acre for New York State
Improved land in farms	282,817	. . . .	. . . .	. . . .
Hay and forage	67,539	82,468 tons	1.2 tons	1.4 tons
Timothy and clover mixed	42,319	46,835 tons	1.1 tons	1.1 tons
Timothy alone	18,105	20,469 tons	1.1 tons	1.1 tons
Clover alone	2,257	2,704 tons	1.2 tons	1.3 tons
Alfalfa	195	536 tons	2.8 tons	2.5 tons
Corn	19,261	728,478 bushels	37.8 bushels	35.5 bushels
Oats	33,080	996,239 bushels	30.1 bushels	26.7 bushels
Wheat	26,717	577,082 bushels	21.6 bushels	23.0 bushels
Barley	1,472	32,237 bushels	21.9 bushels	24.0 bushels
Buckwheat	1,519	31,065 bushels	20.5 bushels	19.9 bushels
Rye	1,496	28,141 bushels	18.8 bushels	15.4 bushels
Beans	5,265	73,273 bushels	13.9 bushels	14.5 bushels
Potatoes	6,918	663,192 bushels	95.9 bushels	123.2 bushels

Although Niagara County excels in fruit production, it is seen from table 5 that the grain yields compare favorably with the average for New York State; in some of these this county is above the average, in others below.

Farm management

During the late fall of 1914, in cooperation with the United States Department of Agriculture and the New York State College of Agriculture, a survey was made of eighty-seven farms in the township of Newfane, typical of the intensive fruit-growing section of the county. In this survey no selection of farms was made, but every farm on the roads traveled by the surveyors was visited, and statistics relating to the year of 1913 were gathered. This included eighty-seven farms, ranging from ten to one hundred and seventy acres in area. For this section, yields and prices in 1913 were more nearly normal than in either 1912 or 1914. From the information gathered, some important facts have been shown regarding the profits of farming in the fruit section of Niagara County.

The average farm area of these eighty-seven farms was seventy-three acres, and the average orchard area was thirty acres per farm, which is a little less than half the total farm area. However, it was shown that the receipts from fruit were 80 per cent of all receipts.

A farmer's labor income is the amount he receives for his own labor. It is found by subtracting from the gross farm receipts for a year the total farm expense, which includes all the ordinary running expenses of the farm, such as labor, board of hired help, repairs, supplies purchased, taxes, insurance, depreciation, and the like, together with interest on the capital invested, figured at 5 per cent.

The average labor income on these eighty-seven farms in 1913 was found to be $1215. Dividing these farms into five groups according to labor income, it was found that the labor income averaged by groups increased or decreased according to the area of bearing fruit, to the area of bearing apples, to the area of bearing peaches, and to the total farm receipts. It was found also what the labor income was in relation to the capital invested. Table 6 shows labor incomes when these farms are grouped according to area of bearing fruit:

TABLE 6.— EFFECT OF NUMBER OF ACRES OF BEARING FRUIT ON LABOR INCOME

Acres bearing fruit	Average acres of fruit	Labor income	Number of farms	Farms making labor income over $2000
Below 5	3.1	$ 312	11	1
5 to 9	7.7	471	20	0
10 to 19	15.0	1,172	22	5
20 to 30	25.5	1,513	15	4
Over 30	47.0	2,335	19	9

Eleven farms had less than 5 acres of bearing orchard and made an average labor income of $312; one of the farmers made over $2000 by selling $3300 worth of cabbage. There are 20 farms with from 5 to 9 acres of orchard. None of these made as much as $2000. Their average labor income was $471. The 31 farms with less than 10 acres of bearing orchard did not make one-third as much as the average. Farms having from 10 to 19 acres of bearing orchard made about average profits. The two groups having the most orchard land made much better than the average. The 19 farms averaging 47 acres of fruit made an average labor income of $2335. These farms made twice as much as the average. About half of them made labor incomes of $2000.

It paid best to have a large business with a large orchard acreage in this part of Niagara County in 1913. In considering these data, however, it should be remembered that while the records show that farming was profitable in this section in 1913, the results for the season of 1914 were very much less satisfactory. It is the intention to make another survey of these farms for 1914.

PRESENT AGRICULTURAL TENDENCIES AND OPPORTUNITIES

The statistics given tell the story of the natural resources of Niagara County and their present utilization. On the other hand, there are many opportunities that have been, and are being, neglected.

Cooperative business organization.— In such a highly specialized section as Niagara County, the best of opportunities are offered for farmers to

organize into cooperative associations for buying farm supplies and for selling farm products. Until 1914, little or no real effort had been made along this line. During the summer of 1914, two cooperative associations were organized for the grading and the selling of fruit, one located at Lockport and the other at Gasport. The growers in the surrounding districts marketed over 50,000 barrels of apples through these associations in the fall of 1914. Herein lies the most fertile field for the fruit growers in this county to develop, for by cooperative buying and selling an opportunity is offered to save a few cents on the cost of each package of fruit sold and each purchase made. The packing cost can be lessened, and the marketing cost can be materially reduced. There is the further advantage, in the opportunity offered, of establishing a reputation for a brand of fruit from a given section, which can never be accomplished by individual growers.

More profitable production.— While Niagara County has many of the best fruit farms in New York State, there are numbers of orchards that have been abandoned to the ravages of insects and disease. These should be either renovated or destroyed. There is also a tendency toward extensive, rather than intensive, fruit growing, which has resulted in many large plantings being made. The expense of caring for these large plantings and the problems involved make them impracticable for a man without a large capital and years of experience in fruit growing. The most successful persons growing fruit on an extensive scale are generally men of middle age or older, who have gradually become established in the business. Young and inexperienced growers should learn the lesson from these successful men, and should increase their plantings only as their ability to handle them develops.

Niagara County does not need more orchards, but rather better cultivation and spraying of the present orchards; it does not need to produce more fruit, but rather to insure better grading and marketing of the present production.

The tendency to overspecialize is also noticeable in the county. Some farmers are growing fruit to the exclusion of all other crops; some carry the practice a step further and grow only peaches. The uncertainty of the results of this practice is shown by the crops of the year 1914. The lesson that should be drawn from this experience is that there is a need of greater diversity in order to develop more sources of income; for example, a soil that will grow peaches will also produce potatoes and alfalfa. Pigs, pastured on alfalfa, make quick and cheap gain. Draft mares can do the farm work, and colts can be raised from them for sale. With a little care, poultry can be developed into a profitable side issue in connection with the fruit farm.

On land that has the high valuation of the fruit land of Niagara County, each farmer should endeavor to get the greatest yield possible from his fields. This should mean the giving of more attention to the adaptation of fruits and crops to soils, to better drainage, to the use of lime, to the selection of seed, and to the growing of alfalfa. The growing of alfalfa will mean the reduction of the area devoted to grain and forage crops necessary to maintain the stock on the farm.

Soil Survey of Niagara County, New York, contains the following in regard to the drainage of the soils in the southern third of the county:

"The present system of open drains would be improved by the use of tile drains in all the laterals and many of the smaller mains. These may be readily manufactured from the subsoil of the Dunkirk clay and the Clyde clay. Tile would drain the land much deeper and would greatly facilitate cultural operations and harvesting. On clay soil the objection is that water penetrates to the tile too slowly. This may be obviated by catch basins and sinks made of stone, brush, or other porous material. The above objection does not apply on the loam and sandy loam soils. The open drains should be kept more free of rubbish and vegetation which greatly reduces the flow of water and consequently the capacity of the ditch. Tile should be laid below two feet to avoid displacement by the frost.

* * * * * * * * * * * *

"On the heavy soils the use of the roller, except where small seed have been planted, should not be practiced. These soils need loosening up and not compacting."

The farmers fairly generally realize that the topography and the soil type make this section best adapted to grain and grasses. The common rotation is: grass sod, corn, oats followed in the fall by wheat, in which timothy is usually seeded in the fall and clover in the spring. After the wheat is removed the next summer, the land is left in grass for hay and pasture for from two to four years. Barnyard manure is sometimes applied before the land is sowed to oats. In some cases commercial fertilizer is applied to oats and wheat, but this is not a general practice.

Not only is the drainage deficient in the greater part of this section, but also the soil is deficient in organic matter. It is generally plowed too shallow; therefore it is dense and poorly aërated.

On the land most suitable for the growing of grain and hay, increased crop production should be worked for by the following means:

1. By the introduction of better systems of drainage. Tile drains should be used where practicable, and community ditches should be constructed in places where they are necessary.

2. By the practice of deeper plowing. This must be done gradually.

3. By the application of more organic matter to the soil. Barnyard manure may be used, or cover crops, such as rye and vetch, that have been seeded in the corn in August and turned under the following spring.

4. By the use of barnyard manure as top-dressing on the meadows.

5. By encouraging the practice of keeping good dairy cows, and the more general use of silos.

6. By the more general use of fertilizers that contain a high percentage of phosphoric acid.

7. By seed selection.

Betterment of schools.— Although the agriculture of the northern and southern parts of the county is dissimilar, yet there is one interest that the inhabitants of the entire county have in common — namely, the education of the farm boys and girls. One-third of the population of Niagara County lives on farms. The farmers are progressive, and they have the keen judgment that is born of experience. In order to insure the future agricultural prosperity of the county, many of the children

must remain on the farms of their fathers, and they should be educated especially for this.

The idea of the union school system was first conceived and put in practice in Niagara County. The farmers of Niagara County demand that their children shall be educated in terms of farm life, in the common things of the farm. How often the high school education is the means of weaning the country boy away from the farm! It prepares him for work in an office instead of in the fields. Every high school that draws its pupils largely from rural districts should include among its departments of instruction a department of agriculture, established on the same basis as its department of languages, and should give agricultural training that will foster in the country boys and girls a love for the life of the farm, a training that will give them at least as good preparation for life and work in the country as for life and work in the city.

PART II

THE FARM BUREAU MOVEMENT IN NIAGARA COUNTY

Perhaps the best discussion of the purposes and the ideas underlying the farm bureau movement is that given before the Erie County Farm Bureau Association, March 17, 1914, by Dr. L. H. Bailey, former Director of the New York State College of Agriculture.[2] In part he said:

" The reason for the introduction of agents into the localities lies in the nature of the situation itself. For many years we have been reorganizing our ideas as to the agricultural and rural basis of our civilization. We have devised institutions and agencies of research and of instruction. We are constantly discovering, preaching, teaching, directing. All this body of new fact and all the interesting and stimulating ideas must be applied; and the application must be made directly in the localities to the persons who live on the farms.

" * * * * * The most effective herald of the new country life is a person, a man or a woman, who resides in the community and is a part of it, and whose business it is to apply and to lead.

" This person cannot solve all the problems or meet all the perplexities, and he will not displace the other agencies or interfere with them; but he will desire to aid and extend them all as well as to have a sphere of his own.

* * * * * * * * * * * *

" The farm bureau agent cannot remove from any man the responsibility of managing his own farm and raising his own products. Of course, he should be ready to go to any farm on call, so far as he is able, for the purpose of giving particular advice on any subject on which he is well qualified; but his larger relation is to be public rather than private. Only to a very limited extent can he direct persons in their farm practices. He is to represent the community or the region; he is to stimulate it; he is to point the way; he is to project meetings, policies, methods of work as applicable to the place; he is to bring in experts and specialists when needed; he is to have an office in which the facts pertaining to the agriculture of the region are assembled and where they will be available for the use of any person who desires them. There are no such facts at the present time. There are headquarters for city affairs, for political affairs, and for other affairs; but we have had no headquarters for local agricultural affairs. He is to be an organizer of information and of movements. He will become a director of agricultural enterprises within his region.

* * * * * * * * * * * *

" Some persons feel that relations with buying-and-selling efforts lie outside the function of the farm bureau agent, but I am not prepared to accept this view. I think that the agent should not himself act as buyer or seller in any case; I think he should not be an officer in any commercial organization; he should not handle funds; but I am convinced that he may attempt to discover where such cooperating groups are

[2]Farm bureau circular no. 3. New York State College of Agriculture.

needed, and that he may give information as to the best means of establishing and operating them. The cooperators may constitute themselves into a buying organization or they may trade through the regular dealers. The responsibility of the business relations should lie with the people or with their regularly established commercial representatives.

* * * * * * * * * * * *

"Inasmuch as the farm bureau is for all the people of its region, so should all these people accept the privilege of its support. I like the idea of a public membership organization, on which the farm bureau rests, every member paying his annual dues. A man will not derive much benefit from a farm bureau until his mind is flexible enough to allow him to contribute money. * * *

"I know that persons ask why they should contribute to the farm bureau if it is the duty of the State and the Nation to support it. They may feel that they pay for it in their taxes. It may be a question whether it is the duty of the State or Nation wholly to support such work. Government will found the plan, provide the machinery of supervision; but even government action must be cooperative with the people if it is to be effective. Taxes support government, rather than the special welfare work of communities. It is not the function of State and National government to carry the details in the localities. The localities should be themselves self-acting. The residents cannot expect to exercise much control over the work if they do not make direct contribution to it."

THE NIAGARA COUNTY COOPERATIVE FARM BUREAU

In the summer of 1912, some of the leading men of Niagara County became interested in establishing a county organization known as the farm bureau. These men solicited and received the cooperation and support of the Board of Supervisors of Niagara County, the United States Department of Agriculture, the New York State Department of Agriculture, and the New York Central and Hudson River Railroad Company. The bureau was supported in 1913 and in 1914 by a fund amounting to $2860, cooperatively contributed as follows:

United States Department of Agriculture	$1,200
New York State Department of Agriculture	600
Board of Supervisors of Niagara County	1,000
New York Central and Hudson River Railroad Company	60

In addition to these contributions of money the bureau received gratuitous privileges from the Lockport Board of Trade in the way of office facilities, and from the New York Central and Hudson River Railroad Company in the form of a pass for the manager of the bureau over its lines within the county.

According to the constitution of the Niagara County Cooperative Farm Bureau, all persons are eligible to membership. The following officers are elected at each annual meeting: president, vice president, second vice president, third vice president, secretary, and treasurer. The Attorney for the New York State Department of Agriculture in and for Niagara County is also one of the officers. The officers of this

bureau constitute the executive committee and are empowered to transact the business of the bureau. Three members of this committee constitute a quorum.

Through the executive committee, the services of the present farm bureau manager, E. H. Anderson, were engaged, and the local farm bureau office was opened in the rooms of the board of trade at Lockport, on March 1, 1913.

The farm bureau movement in Niagara County from the beginning has had in view several lines of work, as indicated in the constitution and by-laws. Its object as set forth is as follows: "To develop the agricultural resources, and to foster the best commercial, social, and material interests of the county." This purpose is to be carried out in the following ways:

1. By federating the agricultural interests of the county. In this county there are several well-organized agricultural societies, all working independently of one another toward the betterment of agriculture in the county. By furnishing a means whereby the granges, the farmers' club, the county fair association, and other agricultural interests can be brought to work together for certain definite objects, the farm bureau can be of great service.

2. By the developing of natural resources and the adapting of crops to local economic conditions. Among these may be mentioned the utilization of the local supply of limestone for agricultural purposes; the growing of a standard variety of wheat that may be used by the Shredded Wheat Company; the drainage of large areas of land by community ditches; and others. The farm bureau is endeavoring to further such development.

3. By aiding in the organization of cooperative associations for the purchase of farm supplies and for the packing and the marketing of fruit. In this county the cost of producing a barrel of apples is at least fifty cents more than it was ten years ago. The return per barrel has not increased in proportion to the cost of production. It is part of the work of the bureau to point out the way whereby the growers can organize to purchase their supplies at wholesale prices and to sell their produce at the highest market prices.

4. By demonstrating better methods of farm practice and farm management. On nearly every farm, improvement can be made in farm practice methods, in more profitable use of forage and cover crops, in better distribution of horse and man labor, and in better adaptation of crops to soils. It is the purpose of the bureau to bring these better practices to the attention of farmers — for example, the growing of alfalfa and the renovation of orchards.

5. By discussing subjects of general importance to farmers in meetings and through the local papers. Owing to the limited number of farmers that can be visited in person, the papers, the granges, and the farmers' club meetings are constantly being used as a means of coming in contact with the farmers of the county. The farm bureau, by keeping in touch with all developments, is in position to offer suggestions, or to sound a warning to hundreds of farmers through the papers and by use of the mail.

6. By giving advice on various agricultural subjects. From the first, the farm bureau has been called on for advice concerning a great range of farm matters. Such questions as relate to fertilizers for given crops demand both a knowledge of the required elements for crop growth and a familiarity with the soils on which they are to be grown. Questions regarding spraying require knowledge of insect life, of fungous diseases, and of spray materials, besides a knowledge of the resistance of plants. Questions on marketing require a knowledge of proper methods of packing, crop conditions, and market preferences. It is only by having considerable practical experience in fruit growing and in general farming, together with technical training in agriculture and the assistance of a good agricultural library, that the manager has been able to answer these questions.

WORK ACCOMPLISHED BY THE LOCAL BUREAU

On entering the county, the first effort made by the farm bureau manager was that of becoming acquainted with the farming of the county by a study of the soils, the topography, and the organizations representing farmers. The next step was that of studying the best methods of farming in use in the county by personal visits to some of the most progressive farmers in each locality, and of becoming familiar with their methods of farm management, the crops grown, the fertilizers applied, and the stock kept. The next effort was that of getting acquainted with farmers. This was accomplished by attending farmers' meetings, by newspaper articles, and by personal calls at farms. From the first, the granges, the farmers' club, and the newspapers of the county have cooperated with the farm bureau in its work.

As the manager became better acquainted with the conditions, certain needs became apparent, and he has been working toward the solution of these more important problems of general interest to the farmers. Among them are included cooperative marketing, seed selection, drainage, better orchard management, use of lime, growing of alfalfa, and agricultural education for the farm boy and girl.

It has been the practice to respond to personal calls for farm visits whenever possible. At first all requests could be met; but for the past few months, neither time nor funds would permit responding to all calls. The method of travel is by train and livery, and the area covered, with the time and money available, is necessarily small.

In order to come in contact with a larger number of farmers, the bureau has adopted the plan of sending to farmers letters containing timely advice on important subjects, and also publishing "Timely Hints to Farmers" in the county papers.

Summary of the principal results of the farm bureau during the first twenty-two months of operation, ending December 31, 1914

Four hundred and twenty farmers have been visited on their farms, and the manager has received 425 calls from farmers at his office.

Forty-one farmers' meetings have been addressed, with a total attendance of 5971 persons.

Thirty-four agricultural articles have been furnished to and published by the papers of the county.

Specific information has been sent out by letter to 405 farmers, and 4200 letters of general information have been mailed.

In accordance with the suggestions of the farm bureau manager, crop rotations have been planned on 24 farms; crops have been grown on 75 farms; orchards have been cared for to the number of 105; alfalfa has been started on 12 farms; seeds have been treated on 300 farms; 100 tons of fertilizer have been applied; 40 tons of fertilizer have been mixed at home; 4000 tons of lime have been used.

From the first the bureau has fostered the idea of cooperation among the fruit growers of the county, and has been instrumental in the formation of three cooperative associations. Growers at two other points have expressed their desire to receive assistance in organizing for another season.

That the farm bureau is valued and is being used more and more by the farmers of the county, is shown by the following: In the first nine months, the agent visited 145 farmers on their farms; in the second nine months, 275. In the first nine months, 50 personal calls on the agent were made by farmers, and 25 calls were made by letters; in the second nine months, 337 office calls were made, and 380 calls by letters.

Dr. L. H. Bailey says:

" There need be no conflict between the farm bureau and other extension agencies, and no disturbing duplication of effort. The farm bureau will accept the situation as it exists, work with all other genuine and useful enterprises for the public benefit. It will find work of its own, for there is work enough to be done."

REFERENCES TO PUBLICATIONS RELATING TO THE AGRICULTURE OF NIAGARA COUNTY

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FIVE WAYS IN WHICH A FARM BUREAU HELPS A COUNTY

1. It organizes local effort, individual and collective, for community betterment. It stands for agricultural progress.

2. It is a headquarters for local agricultural affairs, a place where reliable information about local farming is available.

3. It makes systematic reconnoissance and detailed surveys of the agricultural resources of the county, and of the organization and the conduct of its farms.

4. It provides for emphasizing strong points and strengthening weak ones by means of cooperative tests and demonstrations.

5. It furnishes to individuals assistance in making their business more profitable by tending to increase production, by promoting standardization, and by securing better distribution of farm products, thereby benefiting every citizen.

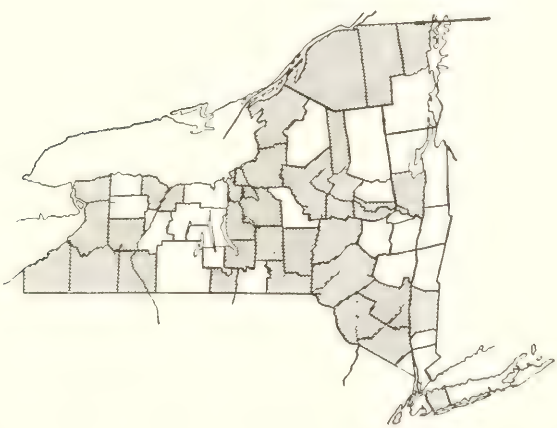
CIRCULAR No. 6 JUNE, 1915

FARM BUREAUS OF NEW YORK

NEW YORK STATE COLLEGE OF AGRICULTURE, NEW YORK STATE DEPARTMENT OF AGRICULTURE, UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

SUMMARY REPORT OF FARM BUREAU WORK IN NEW YORK STATE FOR THE CALENDAR YEAR 1914

M. C. BURRITT AND COUNTY FARM BUREAU MANAGERS



The darkened areas show the counties in which farm bureaus had been organized up to June, 1915

ITHACA, NEW YORK
PUBLISHED BY THE UNIVERSITY

C. B. Smith, Agriculturist in Charge Farmers' Cooperative Demonstrations, North and West, United States Department of Agriculture.

C. S. Wilson, Commissioner of Agriculture New York State.

Beverly T. Galloway, Dean New York State College of Agriculture.

Sirs:

I have the honor to present herewith the second annual report of farm bureau work in New York State for the calendar year ending December 31, 1914. This report is a summary of the organization, supervision, financial support, and work of the farm bureaus during the past year. The work is for the most part still in process of introduction and organization, although much has already been accomplished in most of the counties in the stimulating of local initiative, the organization of movements and enterprises, and in cooperative trials and demonstrations of farm practice and farm management.

I wish to take this occasion to express my appreciation of the energy, the ability, and the loyalty of all the farm bureau managers in carrying forward this new movement in agricultural education and development in the spirit of cooperation that has been manifest in all the work. On behalf of all farm bureau workers, I wish also to express appreciation of the spirit of helpfulness and cooperation manifested by members of the college staff and of the farmers' institute force in joining hands with us in this work.

Very truly yours,

M. C. Burritt,

Director of Farm Bureaus.

SUMMARY REPORT OF THE STATE DIRECTOR

The third year of farm bureau work in New York State has just closed, and it is proper that a résumé of progress made during this year should be set forth.

PROGRESS

At the beginning of the year 1914, there were nineteen farm bureaus in operation in the State. A list of the counties having bureaus, the dates of their organization, the membership in farm bureau associations at the beginning and at the end of the present year, the names of the managers and their addresses follow:

County	Date of organization	Membership Mar. 1, 1914	Membership Dec. 31, 1914	Manager	Address
Broome	Mar. 1, 1911	70	200	E. R. Minns [2]	Binghamton
Chemung	April 1, 1912	30	100	M. E. Chubbuck [3]	Elmira
Jefferson	April 16, 1912	......	42	F. E. Robertson	Watertown
Oneida	Nov. 1, 1912	203	371	G. W. Bush	Utica
Clinton	Dec. 2, 1912	377	382	C. B. Tillson	Plattsburg
Herkimer	Dec. 2, 1912	135	300	C. A. Taylor [4]	Herkimer
Chautauqua [1]	Jan. 1, 1913	......	......	H. B. Rogers	Chautauqua
Niagara	Feb. 1, 1913	......	......	E. H. Anderson	Lockport
St. Lawrence	Feb. 15, 1913	45	48	C. S. Phelps	Canton
Cortland	Feb. 24, 1913	......	......	E. H. Forristall	Cortland
Franklin	April 1, 1913	......	150	O. F. Ross	Malone
Monroe	April 15, 1913	180	388	L. A. Toan	Rochester
Wyoming	May 1, 1913	101	430	H. M. Bowen [5]	Perry
Onondaga	May 1, 1913	100	400	S. A. Martin	Syracuse
Cattaraugus	June 10, 1913	90	212	H. K. Crofoot [6]	Olean
Allegany	July 1, 1913	134	103	F. C. Smith	Wellsville
Dutchess	July 1, 1913	160	220	F. H. Lacy	Poughkeepsie
Oswego	July 1, 1913	10	73	E.V. Underwood [7]	Oswego
Tompkins	Dec. 1, 1913	170	180	V. B. Blatchley [8]	Ithaca
Total membership	....	1,805	3,599	....	....
Average membership	....	129 (14 counties)	225 (16 counties)	....	....

[1] Chautauqua County Farm Bureau started independently, but affiliated with the central organization February 1, 1914.
[2] J. H. Barron manager until March 1, 1912.
[3] G. P. Scoville manager until September 15, 1914. M. E. Chubbuck began work November 16, 1914.
[4] M. E. Chubbuck manager until November 15, 1914.
[5] W. L. Markham manager until February 1, 1914. H. M. Bowen began work March 1, 1914.
[6] H. E. Babcock manager until December 1, 1913.
[7] H. M. Doyle manager until September 1, 1914.
[8] H. E. Babcock in charge until November 1, 1915.

During the year eight more bureaus have organized. The list which follows gives similar data for these counties, which are listed in the order in which they began work.

County	Date of organization	Membership Mar. 1, 1914	Membership Dec. 31, 1914	Manager	Address
Erie	Feb. 1, 1914	150	348	W. L. Markham	Buffalo
Otsego	Feb. 15, 1914	470	660	F. S. Barlow	Cooperstown
Delaware	Mar. 1, 1914	70	110	T. M. Avery	Walton
Montgomery	Mar. 1, 1914	125	204	A. S. Merchant	Canajoharie
Cayuga	April 1, 1914	......	206	J. R. Teall	Auburn
Ulster	April 1, 1914	......	260	W. H. Hook	Kingston
Nassau	Aug. 1, 1914	......	......	L. R. Simons	Mineola
Orange	Jan. 1, 1915	......	350	T. E. Milliman	Goshen
Total membership		815	2,138		
Average membership		204	305		
Total of all counties		2,620	5,737		
Average of counties		145 (18 counties)	250 (23 counties)		

Nine other counties in the State are working definitely on plans of organization. In some of these counties, associations have been formed and in all of them committees appointed. These counties are: Madison, Albany, Westchester, Rockland, Chenango, Warren, Saratoga, Sullivan, Suffolk.

Miscellaneous inquiries have been received from nearly every agricultural county in the State, but in so far as we are aware there is no definite and organized movement to bring about the formation of a farm bureau in any other counties at the present time.

The farm bureau work in New York State had its beginning in the desire of a chamber of commerce and a railroad corporation to develop the agricultural resources of a farming community in southern New York. The advice of the College and the Government was sought, and out of a conference grew a plan to employ an agricultural expert to give his whole time to work in this one locality.

In every farm bureau organized during 1911 and in several farm bureaus organized in 1912, the work was brought about through the initiative of the local chamber of commerce with the substantial financial aid of the Federal Government, the Crop Improvement Committee of Chicago, and railroad companies. It is safe to say that without assistance from these essentially non-farmer agencies, which usually amounted to about $2500 per county, the first ten counties to organize farm bureaus in New

York State would probably not have had these institutions until one and more likely two years later. Of the last fifteen bureaus formed, at least ten were organized by farmers, who raised from three- to four-fifths of the money required, and began the work without either Government (except the franking privilege) or Crop Improvement Committee aid. With few exceptions, these bureaus have made as much progress in a year as was made in two years in counties where farmers were not interested, either in the finances or in the management. This progress was not so much due to the managers (agents) as to the membership and the interest of farmers in these counties. It is an illustration of the old and sound principle of self-help, which is always the most effective.

It is an easy matter for the Government or the State to organize a farm bureau and to appoint an agent to work with farmers. It is not so easy to stimulate counties and communities to work for themselves, but it is vastly more effective. If we have learned one thing better than another in New York State, it is this fact. Now our policy is not to encourage the organization of a farm bureau in a county until several hundred farmers indicate their interest by forming an association and locally providing at least three-fifths of the finances, as well as assuming the responsibility for the work and the manager. It will be noted that while the first nineteen bureaus organized have an average membership of 225 farmers the last 7 organized average 305 members. We have had marked successes with the old method, but they have been due chiefly to the individual ability and the personality of the farm bureau managers. In several of these counties the bureaus are now being reorganized.

ORGANIZATION AND FUNCTIONS

The central office of farm bureaus, located at the State College of Agriculture, represents the United States Department of Agriculture through its office of Farmers' Cooperative Demonstrations, North and West, in its extension service; the New York State Department of Agriculture through its Bureau of Farmers' Institutes; the New York State College of Agriculture; and the various farm bureau associations in the State, which are receiving State and Federal aid and have signed a memorandum of understanding regarding the conduct of the work.

The method of procedure in the organization of farm bureaus is as follows:

Local farm bureau associations are formed by representative farmers and other persons interested in the agricultural development of a county. In doing this the persons interested usually ask and receive aid from the director's office. These associations should comprise a minimum of ten per cent of the farmers of the county. Having completed its organization, such an association applies to the director, as the representative of the State and Federal Governments, for financial aid, supervision, and cooperation. A general memorandum of understanding is then prepared by the director stating the terms under which such assistance may be granted. When this is properly signed by the cooperating parties, the treasurer of the farm bureau association, when

properly bonded, is certified to the State Commissioner of Agriculture, who assigns to the county State money at the rate of $50 monthly. The farm bureau association through its executive committee then recommends from several candidates well trained in the science and practice of farming, suggested by the director or otherwise, one to be manager of the local farm bureau. If the director approves of the person recommended, he then recommends this manager to be appointed a collaborator in the United States Department of Agriculture at a salary of $50 monthly, which if there is no reasonable objection, is done. The farm bureau manager has headquarters at a convenient point within the county.

Each manager cooperates closely with local organizations, such as granges and farmers' clubs, wherever these exist (where they do not he may organize a local group for this purpose), and with individuals in each community known as local councilmen for the following purpose:

1. To unite existing local agricultural forces and to organize new lines of effort.

2. To exercise and to develop local leadership in rural affairs in each community.

3. To find out, arrange, and make available to the public important facts about local agriculture, farm practice, and farm management.

4. To conduct concrete and convincing tests and demonstrations to show the importance and value of certain farm practices, methods, and principles of management, and to point out their local application.

5. As the joint representatives of the State College of Agriculture and the Agricultural Experiment Station and of the State and Federal Departments of Agriculture to coordinate and apply the work of these and other agricultural institutions locally, as well as to act as a local headquarters for agricultural information.

In order to carry out these purposes farmers and members of their families are met individually and in groups in fields, barns, creameries, schools, homes, and elsewhere.

The functions of the central office, representing the above institutions, may be classified as follows:

1. To carry on the supervisory, the administrative, and the clerical work necessary to properly execute the provisions of the State and Federal laws under which the work is carried on.

2. To assist in organizing farm bureaus in new counties.

3. To draw up and put into effect state-wide and regional subprojects covering proposed work.

4. To assist and advise county farm bureau managers to carry out these projects.

5. To acquire, arrange, and distribute technical and popular information relative to the work.

6. To establish and to maintain satisfactory and desirable cooperative relationships with other related agencies.

7. To investigate the organization, the methods of work, and the administration of the local farm bureaus for the purpose of determining the most effective ones.

In carrying out these purposes, the State director and his assistants keep in close touch with the local farm bureau managers, officers, and

councilmen by means of personal letters, circular letters, and a mimeographed publication known as the *Farm Bureau Monthly*, travel to the counties and hold personal conferences with managers, officers, and committeemen, and attend and address farmers' meetings.

The report of work for the year 1914 will be given under the preceding outline so as to show how these functions have been exercised during the past year.

Administration

The staff of the central office consists of a director and an assistant director, a clerk and stenographer, and a second stenographer. The office is supported financially by the Federal Department of Agriculture, the State College of Agriculture, and the State Department of Agriculture.

The following table shows the activities of the central office during the past year:

Total number of visits made to bureaus in the State	115
Total number of individual conferences held with the managers	136
Trips made to counties not having bureaus in order to furnish information	23
Attendance at meetings at which the director spoke on farm bureau work	6,582
Total miles traveled by railroad by the director	23,300
Total miles traveled by automobile and horse and buggy	1,651
Total number of days in office	151
Total number of days in field	147
Total number of official letters written	3,067
Total number of circular letters sent out	28
Total number of days' leave	$10\frac{1}{2}$

Further reference will be made to these activities under the heads that follow:

Finances.— Reports on receipts and expenses during the past year, and estimated resources and expenses during the coming year have been furnished by each of the farm bureaus of the State. A summarized table of these follows:

FINANCIAL STATEMENT OF TWENTY-SEVEN FARM BUREAUS IN NEW YORK STATE

County	Amount received, 1914	Amount expended, 1914	Estimated resources, 1915	Estimated expenditures, 1915
Allegany	$2,435.83	$2,435.83	$2,880.00	$2,749.00
Broome	4,707.20	3,541.60	4,345.00	3,830.00
Cattaraugus	3,376.00	3,376.00	3,750.00	3,650.00
Cayuga (8 months)	2,244.00	2,254.93	3,615.07	3,670.00
Chautauqua	3,159.63	3,081.44	3,658.19	3,580.00
Chemung	4,204.72	4,204.72	4,200.00	4,200.00
Clinton	3,813.87	3,063.87	3,265.00	2,995.00
Cortland	5,627.78	4,173.39	5,229.39	4,610.00

FINANCIAL STATEMENT OF TWENTY-SEVEN FARM BUREAUS IN NEW YORK STATE (*concluded*)

County	Amount received, 1914.	Amount expended, 1914	Estimated resources, 1915	Estimated expenditures, 1915
Delaware (9 months)	$2,248.50	$2,825.42	$3,438.48	$3,025.00
Dutchess	2,191.37	2,331.43	2,625.00	2,626.00
Erie (11 months)	5,757.84	4,539.56	7,681.28	6,635.00
Franklin	3,355.64	3,076.84	3,293.82	3,210.00
Herkimer	3,068.49	2,892.41	3,056.08	3,086.00
Jefferson	4,373.94	3,873.32	4,120.62	3,315.00
Monroe	3,895.67	3,515.82	4,434.75	4,105.00
Montgomery (10 months)	2,400.00	1,803.85	3,756.15	3,540.00
Nassau (5 months)	2,409.00	2,004.41	3,800.59	3,800.00
Niagara	3,028.44	2,906.62	3,781.82	3,700.00
Oneida	5,136.40	5,035.21	4,411.19	4,325.00
Onondaga	4,657.46	4,400.68	6,803.78	5,300.00
Orange	....	....	4,090.00	3,850.00
Oswego	2,627.63	2,335.73	3,058.40	2,765.00
Otsego (11 months)	3,743.40	3,569.33	4,424.07	4,000.00
St. Lawrence	4,299.72	3,922.12	3,286.60	3,285.00
Tompkins	2,485.81	2,395.81	2,620.29	2,365.00
Ulster ($8\frac{1}{2}$ months)	2,881.00	2,448.00	4,293.00	3,340.00
Wyoming	3,105.34	2,809.66	3,415.68	3,105.00
Total	$91,234.68	$82,818.00	$107,271.25	$98,661.00
Average per county	$3,509.03	$3,185.30	$3,973.01	$3,654.11

SOURCES OF FINANCIAL SUPPORT OF FARM BUREAUS IN NEW YORK

Sources	1914		1915	
	Total	Per county	Total	Per county (approximate)
Boards of supervisors	$32,501.71	$1,250.00	$40,248.29	$1,490.00
New York State Department of Agriculture	14,500.00	....	16,200.00	600.00
United States Department of Agriculture	12,612.80	....	17,400.00	600.00
Membership	3,741.10	144.00	8,276.50	300.00
Chambers of commerce	8,269.71	318.00	6,361.00	235.00
Railroads (cash)	5,736.86	221.00	6,298.00	230.00
Private and corporation contributions	4,847.20	186.00	4,535.00	168.00
Miscellaneous, including balances	9,025.30	345.03	8,553.46	350.00
Total	$91,234.68	$3,509.03	$107,271.25	$3,973.00

Principal Items of Expense of Farm Bureaus in New York

	1914 total	1915 Total (estimated)	1915 Per county (approximate)
Salaries	$44,826.56	$53,810.00	$2,000.00
Traveling expenses	4,261.71	4,925.00	180.00
Office rent*	4,935.75	5,963.00	220.00
Stenographic help	6,169.33	8,825.00	325.00
Office equipment	2,087.96	1,790.00	65.00
Printing	2,606.40	3,674.00	135.00
Telephone and telegraph	929.25	1,314.00	50.00
Automobiles (purchase costs)	4,876.35	2,430.00	....
Automobile repairs and maintenance	6,707.24	8,485.00	315.00
Livery	935.20	857.00	34.00
Equipment purchased	1,081.73	1,915.00	180.00
Expert help	1,250.36	1,378.00	150.00
Home economics	....	1,350.00	
Miscellaneous	2,150.16	1,945.00	
Total	$82,818.00	$98,661.00	$3,654.00

* Includes value of offices furnished not cash as well as cash.

In the case of practically every one of the bureaus the estimated resources equal or exceed the estimated expenditures for the year 1915, showing that the work is in a sound financial condition. The total expenditure for farm bureau work in 1914 was $82,818.30, while the receipts were $91,234.68, leaving a net balance on hand January 1, 1915, of $8416.38. The total resources in 1915 are $107,271.25, or an average of $3973 for each bureau. The average estimated expense of conducting a farm bureau in 1915 is $3654, distributed about as follows: salary of manager $2000, traveling expenses of manager $180, office rent $220 (not always cash), stenographic help $325, office equipment $65, printing $135, telephone and telegraph $50, automobile operation $315, livery $34, and miscellaneous expenses $330. Nearly two-thirds of the total resources are derived from local sources of which appropriations of the boards of supervisors form the largest item, averaging $1490 per county.

Each farm bureau manager makes weekly reports to the director of the work done during the current week. This report includes a statement of the number of farmers visited and the purpose of visiting them, a list of meetings attended with the number of persons present, and a brief statement of the general character of the work carried on during the week. It enables the director to keep in close touch with the work in the counties and to offer suggestions for the good of the work, and at the same time it furnishes much valuable information, which is given to the general public. Monthly financial reports, which include a summarized statement of all expenses and of total receipts during the month and balance on hand at the end of the month, are also made by the manager and the treasurer of each bureau.

Each manager also makes a semiannual report on July 1. A summary of these reports was made by the director at that time. The annual reports

made for the year ending December 31 have been received and tabulated. A summary statement of the work done follows.

Summary statement of other work done by twenty-six farm bureaus.— Twenty-six farm bureau managers visited 8647 farms in 1914, an average of 332 apiece. Counting revisits, 13,400 farm calls were made. Business calls to the number of 8700 were made by farmers on the managers at their offices, or 335 for each manager. Telephone calls to the number of 15,375 were made, or 767 per manager. Letters to the number of 36,857, or 1535 for each of 24 men, were written.

A total of 1436 meetings, with an attendance of 109,385, were held during the year. This means that an average of 55 meetings, with an attendance of 4207, or 76 persons per meeting, was held in each county. Eighteen managers assisted in organizing 47 associations for adults with a membership of 1908, or 41 in each association. Twenty-seven of these organizations were cow-testing associations. Nine managers helped to organize 31 boys' and girls' clubs with a total membership of 2182.

TOTALS AND AVERAGES OF FARM VISITS, MEETINGS, ORGANIZATION AND OFFICE WORK OF TWENTY-SIX BUREAUS IN 1914

	Farmers visited on their farms	Total number of farm visits made	Business calls on agent at office	Telephone calls to and from agents, office	Meetings addressed	Total attendance at such meetings	Associations organized for adults	Total membership of such associations	Agricultural articles published in county papers	Circulars, circular letters, or bulletins written	Copies of such circulars or bulletins distributed	Letters written
Allegany	527	682	282	300	77	9,810	2	85	58	60	800	4,328
Broome	417	606	300	......	54	3,165	2	39	20	8	5,200	2,400
Cattaraugus	473	673	300	......	73	4,976	2	97	31	15	5,000	2,710
Cayuga *	271	271	350	1,100	57	3,345	1	205	7	7	1,000	1,100
Chautauqua	391	482	20	100	28	2,790	.....	.....	2	20	5,764	......
Chemung	400	600	250	100	44	3,400	2	125	10	13	19,500	500
Clinton	325	760	200	1,500	32	1,632	1	30	8	6	2,400	2,080
Cortland	239	467	1,400	2,100	86	5,949	3	85	8	27	3,500	3,735
Delaware *	452	637	222	900	44	4,224	4	110	10	6	400	1,320
Dutchess	800	1,200	600	600	42	1,600	1	85	40	7	5,000	3,200
Erie	167	258	270	500	101	7,129	1	75	1	2	5,000	1,097
Franklin	231	450	300	900	79	5,816	3	145	20	10	1,000	450
Herkimer	400	1,000	350	......	23	1,000	.....	.....	35	2	1,200	......
Jefferson	375	450	650	1,000	99	6,680	4	128	20	14	4,800	3,000
Monroe	186	394	525	2,075	83	7,014	.....	.....	40	16	5,600	1,250
Montgomery	205	287	85	700	40	3,003	.....	.....	45	8	3,000	810
Nassau *	215	341	91	102	13	1,197	.....	.....	5	2	500	755
Niagara	270	385	375	125	26	3,900	.....	.....	26	7	4,200	525
Oneida	200	577	300	2,000	30	2,370	5	200	15	6	3,000	2,000
Onondaga	335	429	435	......	32	....	3	75	5	8	3,200	555
Oswego	383	450	60	73	45	3,825	.....	.....	8	5	225	320
Otsego *	367	409	106	......	67	3,585	4	117	.....	9	6,300	1,858
St. Lawrence	244	281	190	76	141	11,300	3	160	20	13	7,200	585
Tompkins	309	550	48	250	21	760	.....	.....	48	13	2,600	1,120
Ulster*	234	320	55	174	33	4,975	1	25	25	9	1,500	654
Wyoming	224	472	200	......	66	6,000	5	120	25	36	2,329	540
Total	8,647	13,400	8,700	15,075	1,436	109,385	47	1,908	512	328	107,118	36,857
Number averaged	26	26	26	20	26	26	18	18	25	26	26	24
Average	332	515	335	767	55	4,207	2.6	106	20	13	4,120	1,535

*Farm bureaus in these counties were not operating a full year. The records in Cayuga County cover 9 months, Delaware 9 months, Nassau 5 months, Otsego 10½ months, and Ulster 8½ months. Blanks mean that no report was made.

Forty-three students were directly influenced by managers to attend agricultural colleges. Assistance was rendered the College in conducting 37 extension schools, with total attendance of 1470 persons. Twenty farmers were influenced to attend short courses at college, 319 schools were assisted in developing agricultural instruction, and 6544 pupils were reached by such instruction. The managers distributed 505 library books to farmers.

One thousand and twenty-two farmers conducted demonstrations for the farm bureaus, 204 meetings were held to inspect these demonstrations, and 5865 farmers attended them.

With relation to the farm and the farmstead, the following things were done on the suggestion and with the assistance of the managers: 86 farm buildings were planned or improved, 22 silos constructed, 17 water supply systems introduced or improved, 11 home grounds planned or improved, sanitary conditions improved on 14 farms, 67 farm plans — partial or complete — made, and 138 drainage systems planned.

One hundred and fifteen farmers selected field corn, 83 acres were planted with selected seed, 72 farmers made tests for germination and planted 356 acres with such tested seed,— all under the direction of the managers. Two hundred and eighteen farmers treated seed oats for smut and 1712 acres were sown with tested seed, as a result of the managers' work. Under the managers' direction, 216 farmers used hill-selected potatoes, and 168 farmers treated potatoes for scab.

A striking feature of the work was that the managers influenced and assisted 362 farmers to sow 1323 acres of alfalfa throughout the State. Four hundred and twenty-three farmers inoculated the soil for alfalfa and planted 1168 acres with inoculated seed, under the managers' direction.

Fruit growers were assisted in the planting of 19 orchards and in caring for in whole or in part of 398 orchards. Assistance was rendered 17 farmers in improving woodlots.

In relation to live stock, 36 registered bulls and 6 registered boars were secured on the suggestion of the managers. Nineteen registered sires were transferred from one community to another, and 219 dairy cows purchased. Twenty-seven cow-testing associations were organized by the managers with the assistance of the Bureau of Farmers Institutes of the State Department of Agriculture and 21,700 cows were on test during the year. Seven live-stock breeding associations were organized by the managers, 153 farmers were influenced to feed more live stock on their farms, and 666 balanced rations were figured by the managers and adopted by farmers. Four hundred and eighty-three farmers were given information on poultry management.

As a result of the suggestion and assistance of the farm bureaus, 60 farmers made better use of manure and straw than formerly, 393 farmers mixed 1169 tons of fertilizers at home. One of the most important accomplishments of the farm bureaus during the year was that as a result of their work, 3115 farmers used 20,214 tons of lime. Eleven local sources of lime were developed by the farm bureaus during the year.

Six hundred and three acres of meadows and 28 acres of pasture were top-dressed. Two hundred and sixteen acres of soy beans, 2497 acres of vetch (1500 acres in Jefferson County alone), and 65 acres of sweet

clover were planted through the managers' efforts; and 336 farmers used one or more of these crops for green manure.

Eight hundred and eighty-two farm surveys were made in 15 counties, including 300 in Chemung County; 151 farmers were assisted in keeping farm accounts, partial or complete, and the seasonal distribution of labor was improved on 6 farms.

In a business way the managers furnished information and other similar assistance in organizing 9 purchasing and marketing associations, which did a business aggregating $134,100. Eight farmers' exchanges were organized through the farm bureaus, doing a total business of $3506, at little or no cost. Four hundred and eighty-seven farmers were supplied with farm labor through these exchanges, including 230 in Cayuga County.

In addition to this work a good deal of miscellaneous work of other kinds has been performed, such as spraying potatoes, assisting school children in the collecting of tent caterpillars, helping to control army worms and grasshoppers, making exhibits at the agricultural fairs, advertising the advantages of the county, making live-stock surveys and publishing lists of pure-bred stock, lecturing and furnishing information to granges, improving timothy by selection and breeding, assisting in making and laying concrete work, and the like.

During the year the total membership in the farm bureau associations has increased from 2620 in 18 associations, an average of 145 each, to 5737 in 23 associations, an average of 250 each. The last seven associations organized have an average membership of 305, showing that the interest in the work is on the increase. There are now 27 farm bureaus in New York State.

New bureaus

The list of farm bureaus given on page 2106 shows that eight new bureaus were organized during 1914 and that nine others have been partly organized. At least two of the latter are likely to complete their organization within the next two or three months. Assistance has been given to committees and to individuals in other counties in organizing farm bureau organizations by sending out circulars and bulletins from the central office about the work of other bureaus in the State and about the requirements for organization. This information has also been given through personal letters and by 23 visits during the year to the counties desiring an explanation of farm bureau work and a knowledge of the requirements that must be met in order to secure State and Federal cooperation.

The furnishing of this information has greatly facilitated the work of organizing bureaus and has been very much in the interest of efficiency. In the case of a number of counties, nearly a year has been gained in the work because, through the information and the organization given at the start, these bureaus have been able to begin where the earlier bureaus, without experience, found themselves at the end of a year. The work, particularly the visits, has taken a good deal of time, but this time has been well spent. Farm Bureau Circular 1, which will be revised during the coming year, will furnish much of the desired information. The annual reports of the managers, included in this report will furnish additional information to counties desiring to organize farm bureaus.

Projects

During the latter part of the year much consideration has been given to the project plan of work, which has been adopted. It is simply a plan for making not only the county but the State supervisory work more definite and hence of more value. The plan is simply to outline definitely on paper the work proposed for the succeeding year. Consideration is given to the comparatively most important matters, and stress is laid on these. A well-organized effort is then made to keep the work in these channels that have been outlined, and to avoid too miscellaneous and purposeless effort, particularly with individuals. The objects and the methods of procedure and the cooperation involved in the State farm bureau project have been given on page 2107, under the section on "Organization and Functions," in this report.

The general plan for the counties involves three kinds of projects. The first is called a state-wide project, because it applies in a large percentage of the counties in the State, and is regarded as the most important which can be undertaken by any bureau manager. The primary purpose for the existence of the farm bureau is to increase the profitableness of farming. There are three possible ways of doing this: (1) improving the organization and management of the farm by careful analysis and study of the problem; (2) by saving money in the purchase of supplies in quantity for cash instead of at retail and on time; and (3) by securing an increased price through improved quality, standardization, and cooperative advertising of products. A state-wide project should be one that falls under one of these three heads. For the coming year in New York State the farm management survey, or business analysis of a farm, has been adopted as perhaps the most important single thing to be done by the farm bureau manager in his county.

A second, or regional, project is one which may apply to a group of counties having a similar type of farming, due to similar climate, soil, or topography. Such a project should also come under one of the three important means of increasing the profitableness of farming. In one section of the State for example, namely, Allegany, Cattaraugus, and Chautauqua Counties, such a project has been drawn to cover the demonstration of lime and acid phosphate on the hill soils of these counties. Both lime and acid phosphate seem to be limiting factors in crop production, and hence in animal raising in this whole section.

Both the state-wide and the regional projects are usually suggested to the counties by the central office, since they involve cooperation between counties. Supplementing these projects, however, are from one to four local projects, which are drawn by the farm bureau committees and managers in each county. Good examples of these projects are: orchard management; animal husbandry, with the object of encouraging the breeding of pure-bred live-stock and the producing of cheaper milk through better feeding and the elimination of unprofitable cows; meadow improvement by selection and fertilization; boys' and girls' club work; and the like.

Even after four or five important lines of work have been outlined in the county, there frequently remain a number of important pieces of work to be done, which are both needed and demanded in the county.

These are minor, because they do not affect the profitableness of farming as much as the aforementioned projects, although they may assume temporary importance as limiting factors. Good examples of these are: local outbreaks of diseases and insects, such as oat smut, potato scab, codling moth; and the control of weeds, such as wild mustard. Provision is made for doing this and other necessary work, including office work, all of which usually requires only a limited amount of time, and is known as minor miscellaneous projects.

This plan for a definite system of projects is put into effect in the different counties by arranging for a half day's or a day's conference between the director or the assistant director and the local farm bureau executive committee and manager. Charts showing a program of work for the bureau association and sample projects are placed before the manager and the committee in detail, and the whole plan fully discussed. When it is understood, the committee is asked to vote as to whether or not it will adopt such a plan of projects. If it votes to do so, a state-wide and perhaps a regional project are then recommended by the director, and the committee acts on these. By discussion and then by motion, the committee and the bureau manager finally come to a decision on the most important major and minor projects to be undertaken in the county during the year. These are formally voted on and are later drawn up by the bureau manager When tle whole system of projects has been outlined for a county, it is submitted to the state director for final approval and is signed by him and by the president of the farm bureau association.

Assistance in applying projects

At the committee meetings already mentioned and at subsequent meetings and conferences with the managers, definite plans and schedules are drawn for carrying out the project plan of work. In doing this, the director and assistant director make suggestions based on experience gained in other counties and on what after full discussion seems to be the most practical method of procedure.

The central office also renders assistance in arranging for College and Federal cooperation and facilities in carrying out these projects. An effort is being made to so correlate the projects of extension workers in the College of Agriculture with the projects in the different counties that concerted effort may be brought to bear on important local problems.

Information

There are several methods of furnishing information to the counties, in addition to personal visits and addresses as already noted. These are chiefly the *Farm Bureau Monthly*, circular letters, and printed circulars and bulletins.

The publication of the *Farm Bureau Monthly* was begun in April, 1914. Nine issues have been distributed with a total circulation of about 7500. This monthly goes to all officers, managers, and advisory councilmen of all the farm bureaus. Its object, in addition to furnishing information about the work in other counties, is to develop local responsibility for the work, an *esprit de corps*, and a general interest in this great movement.

Twenty-one circular letters have been issued during the year. A list of these follows:

No. 1.— Use of frank
No. 2.— Bureau organization
No. 3.— Annual report
No. 4.— Card index system
No. 5.— Letter heads
No. 6.— Office days and title
No. 7.— Geological survey maps
No. 8.— Geneva bulletins
No. 9.— Extension facilities of the State College
No. 10.— Boys' and girls' club work
No. 11.— Summer work for students of the College of Agriculture
No. 13.— Farm survey schools
No. 14.— School for Leadership in Country Life
No. 15.— Reports, with supplement
No 16.— Farm bureau exhibit at the State Fair, with supplement
No. 17.— Farm bureau association memberships
No. 18.— State cooperative conference
No. 20.— Annual conference and normal institute
No. 21.— Calling for annual reports, also supplement
No. 22.— Reapportioning Federal funds

During the year five circulars have been prepared and distributed by this office as follows:

Number of circular	Title	Circulation (copies)
1	Farm bureaus: what they are and how they are organized and financed in New York State (Professor Tenny, 1913)	5,000
2	Broome County: an account of its agriculture and its farm bureau	6,000
3	Dr. L. H. Bailey on the farm bureau movement	2,500
4	Jefferson County: an account of its agriculture and of its farm bureau	8,000
5	Niagara County: an account of its agriculture and of its farm bureau	4,000

In addition to these publications, the annual and semiannual reports of the bureau managers have been summarized, briefed, and distributed to the public throughout the State.

Relationships

In exercising this function the central office has endeavored to bring about satisfactory and desirable relationships with all other rural and agricultural organizations in the State, so as to promote efficiency and

good feeling in the work. The chief institutions with which it has dealt are: the grange; the public school system; the farmers' institutes, including the cow-testing division and the bureau of cooperation, in the State Department of Agriculture; various departments in the State College of Agriculture; the State Agricultural Experiment Station; and commercial organizations.

The grange, State, county, and local, has been the chief moral support of the farm bureau movement in New York State from its inception, and without this support the bureaus could not have been organized so rapidly or so efficiently as they have been. At various times and places, however, slight misunderstandings have arisen regarding the function of the farm bureaus, and it has been necessary to take steps to correct this misunderstanding and bring about closer cooperation. Some of this feeling still exists, but it is gradually growing less as the work is better understood. In the majority of instances the farm bureaus and the granges are working in the closest cooperation.

Through the district superintendents of schools, school teachers, the Department of Rural Education in the State College of Agriculture, and the State Education Department, a plan has been worked out, which is apparently satisfactory to all concerned, for close cooperation between the farm bureaus and the superintendents of schools in boys' and girls' club and contest work. This plan, in brief, proposes that the organization and the administration of the work will rest with the school superintendents, and that agricultural instruction and assistance will be rendered by the farm bureau managers.

The closest cooperation now exists between the farm bureaus and the Bureau of Farmers' Institutes in the State Department of Agriculture. The farm bureau managers have rendered much assistance in arranging for these institutes and in many instances have taken part in the programs. In return the farmers' institute workers have rendered the farm bureaus great service in introducing them to communities and individuals, thereby establishing them more surely in the confidence of the community. The bureau managers also do considerable follow-up work as the result of contact with individuals at the institutes.

The work of cow-testing associations has developed very rapidly in the State during the past year. The responsibility for the organization and the continuance of these associations rests largely on the local farm bureau managers. In this they have the assistance of expert organizers from the State Department of Agriculture, with which the best of cooperative relationships exists. Cow-testing associations have their own officers, who are locally responsible for the work, but the farm bureau manager renders great assistance in organizing the associations in the first place and in securing testers and looking after the continuance of the work.

In a number of instances there has been cooperation between the farm bureaus and the Bureau of Cooperation in the State Department of Agriculture in the organization of local cooperative societies, and later in using these societies as channels for cheaper purchase of supplies or for marketing products. This relationship has not been altogether satisfactory, because much of the cooperative organizing that has been

done in the State during the past year has not been economically sound or demanded by the localities. In a few cases it has resulted in a setback to the farm bureau movement rather than an advantage. In three counties, Oneida, Dutchess, and Niagara, however, cooperative organizations formed by the joint efforts of the farm bureau and the cooperative bureau have been productive of good results.

The central office has been instrumental in working out more satisfactory relationships between the various departments of the College of Agriculture and the farm bureau managers. In this it has had the active support and assistance of the Department of Extension Teaching of the College. Arrangements are now perfected whereby practically all extension work that is done in counties having farm bureaus is done in cooperation with or at least after consultation with the local bureau managers. This is true of extension schools, local institutes, farm demonstrations, and extension work with individuals. These relationships are now for the most part very satisfactory. Out of individual cases has come an established policy on the part of the College with reference to such work.

The experiment stations, both at Cornell and at Geneva, have cooperated with the farm bureaus by making analyses of materials and by furnishing expert advice and information on technical matters, as well as by furnishing quantities of their publications for distribution.

Relationships with commercial organizations are now very satisfactory. Railroad companies are generally contributing both cash and transportation to the bureau managers and showing a very commendable spirit of cooperation in other ways. Their efforts are put on the proper basis of stimulating transportation along their lines. In a number of instances cooperation between the local bureaus and the agriculturists of the railroads has resulted in cheaper freight rates and better shipping facilities, which have promoted the interests of both. Corporations whose prosperity depends primarily on the quantity, the quality and the price of farm products, have also contributed to the work in cash and in services. Those which have rendered the most assistance along this line are: banks, lime and fertilizer companies, milk companies, and cement manufacturers.

City chambers of commerce have frequently taken the lead in organizing bureaus, and the chambers have furnished offices, stenographic assistance, and materials gratis. In a number of instances cash has also been contributed.

Investigation

Very little work has been done in investigation. A good deal of miscellaneous investigation of methods of work has been done, but this has not been systematic, and hence is not of great value. It is hoped during the coming year to make some organized effort in this direction so that we may know as definitely as possible the best methods of organizing and conducting the work.

Respectfully submitted,

M. C. BURRITT,

Director of Farm Bureaus.

SUMMARY REPORTS OF THE TWENTY-SIX COUNTY FARM BUREAU MANAGERS

ALLEGANY COUNTY

The work of the Allegany County Farm Bureau Association during the past year has been preliminary. A part of the manager's time has been spent in explaining the work of the bureau and in getting in touch with conditions in different localities. For the purposes of brevity and clearness I will discuss the work as it affects (1) the farm, (2) the community, and (3) the county.

Some of the most important work has been done in connection with farm business and organization. The manager has assisted in planning two farm buildings, has taken about seventy farm survey records, and has interested twenty-five farmers in keeping farm accounts next year.

A limiting factor in farming in the county is the extreme acidity of the soil. Appreciating this, and also desiring to stimulate interest in co-operation, the manager inaugurated a lime campaign. Some farmers were already using lime, and many more began to do so. Now there is greater uniformity of form and quality.

For educational purposes twenty tests were made comparing amounts of basic slag with equivalent amounts of lime and acid phosphate. Ten tests using ground rock phosphate were also started, the results of which will be shown in the future.

Sixty-three acres of alfalfa were seeded last spring and are being watched in order to learn the conditions under which it is advisable to grow alfalfa in this county.

Three farmers treated seed oats for smut with excellent results. Five farmers were assisted in controlling army worms.

Twenty-one orchards were pruned and sprayed. All gave gratifying results, and the owners agreed to spray again next year

Fifteen balanced rations for dairy cows were figured and adopted. Six milk scales were purchased and distributed. Milk record sheets were furnished to ten dairymen. Suggestions as to barn improvements, manure, bedding, and the like, were given as occasion demanded.

Nine farmers were given advice on poultry management, and a number were furnished with formulas for the Cornell rations.

Drainage work has been done on twenty farms. Five lawn improvements were suggested; one water system improved; and one sewage disposal plan put into operation.

A number of minor tests were made with vetch, soy beans, alfalfa, orchard renewal, different varieties of corn, and the like. Eighteen farmers were helped in selecting seed potatoes.

The manager addressed the various granges in the county, and aided the county deputy in reorganizing one society and organizing two new ones. Seventy-seven meetings were addressed with a total attendance of 9810. There were 1500 letters of direct information written to farmers, 1400 circulars and announcements were prepared, and 58 newspaper articles were published.

The bureau has conducted a farmers' exchange for the dissemination of information concerning farms for sale or rent, live stock or other commodities for sale, and for securing hired help.

Assistance was given in starting one boys' potato club, in the county fair stock judging contest, in starting the annual stock judging contest at Alfred with the cooperation of the Department of Animal Husbandry at Alfred University, and in organizing the Genesee Valley Cow-Testing Association.

From the county standpoint, the manager assisted in organizing the Allegany-Steuben Holstein Club, and through the Pomona Grange secured the county cooperative committee, whose object is to find out ways and means of decreasing the cost of farm supplies and of better marketing.

A systematic study of the county statistics has been made, and a circular is being prepared dealing with the agriculture of the county.

Conferences have been held for the purpose of attacking the larger problems of the county. A farm management survey has been arranged for. Definite projects for next year have been written out and approved by the State director. Arrangements have been made to cooperate with the Department of Farm Crops of the State College in working out demonstrations in the county to improve the humus content of the soils, the top-dressing of meadows, and the running of a four-years rotation.

Some work has been done to develop the farm bureau association. Town committees have been organized in a number of towns. The plan is to secure one leader, or committeemen, with the township as the unit for forming a committee. This committee is to work with the manager on the problems of that particular town, cooperating in tests and arranging for demonstrations. These committees will also assist in conducting a membership campaign.

The work of the bureau for the past season has been partly educational, but in the main preliminary in character. A general as well as a detailed survey has shown the principal problems, and has placed the bureau before the public; now the primary work will be to attack those problems that are vital to all the county. F. C. SMITH,

Farm Bureau Manager of Allegany County.

BROOME COUNTY

The activities of the farm bureau in Broome County may be classified as personal problems, demonstrations, agricultural contests, meetings, and organization projects.

PERSONAL PROBLEMS

Certain farmers have made repeated use of the farm bureau as a source of personal help, through requests for farm visits or through calls at the office. During the days of winter and early spring of this year there was an increase of fifty in the number of persons who called at the farm bureau office, compared with the number who called during the same period the year before. There were days when little could be accomplished but attending to the personal problems of callers.

To assist in giving information, bulletins and agricultural books are kept in the office, and some are lent to individuals. A traveling agricultural library of twenty-five volumes was kept here for six months,

and forty-four withdrawals were made from it. I have distributed five hundred State and Government bulletins and circulars within the year and a considerable number of small pamphlets printed by corporations interested in extension work.

Of much more importance than office interviews are the visits to farmers on their own land. One hundred and fifty such visits have been made at the request of persons who wanted assistance. Four hundred and seventeen different farmers have been visited by the manager of the bureau in order to give advice, to investigate conditions, to present a business proposition, or to make a new acquaintance. Including the visits made in pushing organization work, and the repeated calls at a few farms, the total number of recorded visits to farms was 606 for the year.

FARM DEMONSTRATIONS

Demonstrations are the means of solving some personal problems on the farm, but their greatest value lies in the community interest aroused. At the beginning of this year the farm bureau manager offered to cooperate in demonstrations in pasture and orchard renewal in fertilizing timothy meadows and potatoes, in tuber unit potato culture, in the culture of clovers, alfalfa, hairy vetch, and soy beans, in keeping individual milk records, and in farm accounting. Seventy-five farmers asked for one hundred and forty of these demonstrations. As it was impossible to personally supervise so many demonstrations scattered over the county, some had to be dropped.

The most popular of these demonstrations was the pruning of fruit trees, and thirty of these were held with an attendance ranging from the orchard owner alone to twenty-six farmers. Information about spraying orchards was frequently asked for and given. There has been a remarkable increase in the use of spray materials, and a number of orchards have borne crops of good apples as a result of only one spraying.

Every well-cared-for apple orchard producing profitable crops is a demonstration of the merits of modern orchard practice. Six of these demonstration orchards were inspected by fifty persons in the course of an automobile tour that was arranged by the farm bureau. The sight of the trees loaded with fine winter apples and the facts about them as given by their owners aroused much enthusiasm.

Of other demonstrations, we have had a variety. One of these is located on the farm of the Binghamton State Hospital. It consists of several plats on which grass mixtures were grown in 1912. The yields per acre were as follows:

Number of plat	Grass mixture	Yield per acre (pounds)
1	Brome grass (with some redtop on half)	3,351
2	Brome grass and orchard grasses mixed	3,290
3	Orchard grass only	3,498
4	Red alsike clovers mixed with English and Italian rye grasses	1,789
5	Timothy, orchard grass, and alsike clover	3,681
6	Tall meadow oat grass and alsike clover	3,432

The most interesting feature of these yields was the strength of the brome grass and the weakness of the rye grasses. Their appearance the first year was the reverse of their yields at the end of two years.

A feeding test to determine the palatability for horses of the grass from each plat was made by the farmer at the State hospital. The horses readily ate that from each plat except the last; the oat grass was no better than straw for them.

On the farm of the Broome County Home an experimental pasture was established in the spring of 1910. The past season has been the fifth alternate period of grazing and rest, the only treatment for this year. Cattle were turned into the field for the first half of June and of July and shut out of the enclosure for the remainder of each month. Grazing was continuous from August 5 until the close of the season. On August 7 about twenty persons interested in the experiment visited the field and noted the benefit it had received from lime, seeding, and fertilizing in 1911, as well as the gain from restricted grazing periods.

Two demonstrations of the value of top-dressing timothy meadows with chemical fertilizers were carried out on fields where the sod was good. An application of 115 pounds per acre of ammonium sulfate alone caused some lodging of the hay but increased the yield .64 of a ton per acre, which may be considered profitable. For the other demonstration a mixture of 100 pounds ammonium sulfate, 100 pounds acid phosphate, and 25 pounds muriate of potash, was applied to a half acre of old meadow. The unfertilized sod yielded at the rate of 1.3 tons per acre; the top-dressed sod yielded an increase of 1.1 tons per acre, which was worth nearly double the cost of the fertilizer applied.

Demonstrations of the value of liming land that is to be seeded for new meadows have been many and unsolicited. These increased yields are largely the accumulating results of the lime propaganda begun by the farm bureau three years ago. One of these demonstrations was on a field located in a river bottom where a partial top-dressing of marl was applied at the rate of five hundred pounds per acre two years ago, after a wheat crop had been removed from the young seeding. The second crop had the same appearance as the first, and the increase in yield, due to liming at the start, was 50 per cent, or 2124 pounds of hay per acre.

The most instructive demonstration in liming hill land was carried out on the Binghamton State Hospital farm. On a poor hilltop slaked lump lime was applied at the rate of two tons per acre over a part of the field in 1912, previous to seeding it down. This year the limed part yielded 3550 pounds per acre of clear timothy hay, while 1040 pounds per acre of weedy hay were taken from the unlimed part of the field.

Interest in the use of pure cultures of nitrogen-gathering bacteria for inoculating legumes has been gratifying. A number of farmers have tried cultures for clover seed supplied by the United States Department of Agriculture, in order to ascertain if the health and the vigor of the crop could be increased in that way. While some of these experimenters have reported favorably already, the results can be best judged when the hay crop is harvested next year. Cultures for soy beans produced a much darker green color in the leaves on two farms, indicating that much

more nitrogen was gained by the plant when inoculated. The cultures were successfully used on hairy vetch, field peas, and alfalfa.

On account of the success of farmers in other parts of the State with the culture of hairy vetch in oat fields and the meadows following, several demonstrations of this crop have been made with fair success.

Special effort was made to establish demonstrations in the fertilizing of potatoes, and in the selection of seed tubers by the tuber unit and hill methods of improving the stock. Five farmers undertook to carry out the terms of the fertilizer demonstration. Four of the demonstrations were completed successfully, and the fifth was seriously damaged by rot before digging time. The average results from the four showed that the cost of the crop increase due to fertilizing was 12.6 cents a bushel for acid phosphate, 16.4 cents a bushel for home mixed fertilizer, and 18.5 cents a bushel for ready mixed fertilizer of the grower's own choosing. For fairly fertile soil the efficiency of the acid phosphate used alone was established. For poorer soil the complete fertilizers were more efficient. An effort was made to have persons interested see these results in the field. At one of these gatherings the yields and the costs of treatment were figured out for the most instructive of these demonstrations.

There were two experiments with sulfate of ammonia as a source of nitrogen in potato fertilizers. The results indicated that it paid to add the sulfate to the potato fertilizer containing phosphorus and potash.

Tuber unit potato breeding was carried on by three farmers who demonstrated the variable producing power of tubers from the same stock. The product of separate tubers served as illustrative material for one fair.

AGRICULTURAL CONTESTS

Contests among the boys and girls in the rural schools have been encouraged through prizes offered by the farm improvement association and through the cooperation of three district superintendents of schools. One hundred and seven boys and girls have grown potatoes or corn or flowers or garden vegetables, or have kept hens as club work with considerable success. Where the parents and the teachers have been genuinely interested in this club work, the best results have been seen.

Two county-wide contests were brought to a close at the annual meeting of the farm improvement association. The profitable potato growing contest for boys between the ages of fifteen and eighteen years attracted three entries. The prize offered was an educational trip to Washington, D. C., and it was won by Amos G. Carroll, who grew a quarter acre of late potatoes on one of the hilltops in the town of Colesville at a cost of \$12.25 and with a net profit of \$20.38. His yield was at the rate of 262 bushels per acre. Each of the three contestants demonstrated the possibilities of potato culture on the porous hilltop soils.

In order to stimulate greater interest in growing apples, a contest in profitable apple orcharding, open to any farmer in the county, was inaugurated. The silver trophy, which must be won twice by the same person before it can become his property, was donated by six Binghamton business firms dealing in spraying materials. Eight farmers entered the contest. Four contestants finished the race and made exhibits of fruit and cost accounts at the annual meeting of the farm improvement

association. The winner of this contest for the first year was Arthur Ransom from the town of Chenango. The ten trees entered by him showed a net profit per tree of $8.96. E. L. Green of the same town entered fifty-one trees of various ages and made a net profit per tree of $4.11. There are many apple orchards that are eligible to this contest, and it is expected that the number of entries next season will be much larger.

An indication of the interest taken in renewing and properly caring for apple orchards was found when the local dealers in spray pumps and spray materials reported a marked increase in the sale of these articles for 1914.

MEETINGS

At meetings in schoolhouses, at farmers' institutes, granges, and picnics, I have made fifty-four addresses, many of them illustrated with stereopticon slides. The total attendance at these meetings has been 3165. These meetings furnish the opportunity to make new acquaintances as well as to give specific instruction. The two fairs held in the county, at which farm bureau exhibits were made, furnished a similar opportunity. An opening held by a farm supply house in Binghamton was utilized in the same manner.

RURAL ORGANIZATION

Most important of all the work of this year are the steps taken in organization among farm people. It is a common saying that "farmers won't stick together." It is one of the functions of the farm bureau to find incentives for tying them together in cooperative activities. The building up and the strengthening of this association has been foremost among these projects. In one year we have seen a growth of nearly two hundred per cent. In addition to the social and educational benefits it has been the aim of the association to give personal benefits to its members by furnishing the opportunity to buy some of the supplies needed on their farms at wholesale prices. Trading among the members themselves is being facilitated by a farmers' exchange. In the bulletins published by the association carload prices on lime, feeds, and drain tile have been quoted. The secretary of the association has been authorized to collect orders for fertilizer materials from the members on the basis of prices obtained through cooperation with a county association in another part of the State. Orders for one hundred and twenty-six tons of acid phosphate and eight and one-half tons of sodium nitrate have been taken for spring delivery at convenient points in the county. This feature of the membership privileges will save money for those who use it.

The Susquehanna Valley Cow-testing Association

Last spring we discovered that an effort had been made to start a cow-testing association in this county. Believing that the increased efficiency of the dairy cow is the most important problem on many farms, we spent many days of effort in securing the formation of a cow-testing association along the valley of the Susquehanna River in the eastern part of the county. Twenty-five members were enrolled, and the association was organized in the autumn. A tester was hired and began his work on November 11. The county has room for three or four such associa-

tions as soon as the herd owners are convinced that increasing the income per cow at current prices for milk is a wiser and more successful move than any attempt at price regulation without a knowledge of the cost of milk production.

Southern New York Holstein Breeders' Association

There has been a healthy interest in pure bred cattle, especially holstein-friesian. The breeders had no organization and needed one. We found a breeder who was willing to act as a leader in organizing them, and the association was started on October 1 with thirteen members and prospects for at least forty members before the year is out. This association plans to hold an annual sale of stock.

Agricultural extension school

For three years the New York State College of Agriculture has endeavored to reach the farmers through the medium of traveling extension schools. Broome County has never enjoyed the benefit of one of these week-long schools of agriculture and home economics. With the aid of officers in three granges located in the towns of Lisle and Triangle, we have enrolled over fifty students for a school.

Institutes

Six farmers' institutes have been held under the direction of the State Department of Agriculture in this county. The farm bureau has cooperated with the director of farmers' institutes by locating these meetings and taking part in the programs. It has also cooperated with the Binghamton Young Men's Christian Association in holding a poultry institute for an entire week. At the close of this institute the farm bureau manager was authorized to name a committee of five poultry producers to consider what steps should be taken to organize a poultry producers' association in the vicinity of Binghamton. This committee has held two meetings and is securing the necessary information with which to attack the problem intelligently.

CONCLUSION

The Broome County Farm Bureau has had a successful year. Some comparisons of this year's work with that of the previous one show that service through farm visits has increased 85 per cent and through meetings 100 per cent. Cooperation from the farmers of the county has been much more effective, so that demonstration work is a very important part of the service. From a beginning in organization work a year ago we have progressed to no less than five different projects in addition to the parent association, which has recently been incorporated with a board of nine directors and has assumed the direction and the financial support of the Broome County Farm Bureau for the future. We feel assured that agriculture in Broome County is more prosperous than ever and that the farmers have more confidence and interest in the farm bureau than ever before.

E. R. MINNS,
Farm Bureau Manager of Broome County.

CATTARAUGUS COUNTY

Our work in the county during the year 1914 has been planned with three definite purposes in mind: first, to get acquainted with as many persons as possible, which is a comparatively slow process inasmuch as this is a large county; second, to do something that would be worth while to our farming community; third, to disseminate information.

The problem of getting acquainted, though a very important one, has not been given primary attention but has been carried along in combination with the regular farm bureau work. I have found that the best way to do it is to meet a man and to be with him alone for as much time as he and I can spare. Although I have attended over 70 farmers' meetings in the county during the year, with 5000 persons in attendance, I do not feel that I am really acquainted with these men and women as I am with the 500 whom I have met on their farms.

Cattaraugus County is situated in a section of New York State that is not preeminent for high crop yields. I have made a thorough study of local statistics, and have reached the conclusion that a material service can be rendered in increasing crop production. Through various conferences and inspection trips the question of applying lime to land presented itself as foremost in this line of work. We have worked with the railroads and with the lime companies in particular to encourage them to make it easier for our farmers to buy lime. The response on their part has been favorable indeed. Probably 3000 tons of agricultural lime in one or another of its forms has been placed in the county this year through the efforts of the farm bureau. After we had made it easier for the farmers to buy lime through our rates and through cooperation among themselves, considerable attention was devoted to demonstrations in its use. Now at the very close of the year the outlook is encouraging for further increase in the use of lime, because of a still better rate that concerns have given us, due to the fact that we are able to assure them a given volume of business. Farmers' appreciation of this work is shown by a steady growth in the farm bureau membership.

Previous to the farm bureau work in this county some fertilizer companies tried to interest the farmers in their fertilizers, chiefly the phosphorus carriers. The discussion of these fertilizers, in view of the fact that ours is a dairy county, suggested a series of corn tests for developing better ensilage, through a variety test, and for collecting definite local data in reference to the availability of phosphorus in raw rock phosphate, acid phosphate, and basic slag under our local soil conditions. Thirty-one tests of one acre each were made in representative sections of the county. The phosphorus carriers were proportioned on a monetary basis and, together with a check plot, comprised the four quarters of each acre. The following are the average results of these tests, per acre:

	Raw rock	Check	Acid phosphate	Basic slag
Fodder (tons)	11.3	10.1	12.4	12.0
Shelled grain (bushels)	34.3	30.5	40.9	39.8
Number of stalks per bushel ears	329	330	303	302

From these tests acid phosphate seems to produce the best crop yields, undoubtedly because of the availability of its phosphorus under our conditions. The question of source of supply of acid phosphate was then taken up, and farmers are now buying this material through the efforts of the farm bureau, at about two-thirds what it formerly cost. In these tests particular attention was paid to the length of the growing season and to the value of the corn that gave best results when maturity was considered. Considerable seed was selected for next year, and the work will be carried further.

We are encouraging better dairy methods, and as a starter have put into operation one cow-testing association operating on five hundred and eleven head of dairy cattle. Through this association the value of accurate records, of business methods, and of balanced rations for feeding are emphasized.

Some farm survey record work has been done and considerable more is under way, which will reveal the leaks or advantages in any individual farm business and will give us an absolute foundation on which to base further work. Through these surveys, our men are becoming impressed with the value of farm accounts and in a number of instances are adopting some plan of keeping them.

Previous to the establishment of the farm bureau in this county, there has been considerable careless work done in connection with starting and growing alfalfa. This season thirty-seven fields have been started under the direction of the farm bureau, and, at the time of my inspection of them this fall, all but two or three gave every indication of being successful.

Considerable orchard renewal, pruning, spraying, and the like have been started through the farm bureau, together with considerable drainage work, seed testing, and treatment of seed for disease.

Our farmers have obtained considerable information through the farm bureau both by correspondence and through meetings and demonstrations held under its direction. A number of special bureau institutes, demonstrations, and other meetings have been held at which the farm bureau manager has been present, and at which specialists on orcharding, dairying, drainage, and the like, from the State College of Agriculture or from the State Department of Agriculture have been the chief speakers. During this winter season we are holding a series of small meetings throughout the county, touching in particular the outlying districts. These are mostly meetings held in schoolhouses and are from three to seven and eight miles from town.

Not much has been done this year with boys' and girls' club work. We reached only thirty-eight boys; one group of eight composed a potato club, and the remaining thirty composed four stock judging clubs. This boys' club work was new in the county, and it was my intention to make it successful if possible. These clubs therefore received personal attention, and, if I am to judge by newspaper reports and by comments from men whom I met, the work has been successful and seems to present itself as an important feature for any county work. Most of the boys this year received prizes in order to encourage them and to get the work started. The boys' potato club held an exhibit, which was visited by over four hundred persons.

This, in brief, is a story of our work, which is seeking to unite local farm interests, to develop local agriculture, and to make farm life more profitable and country life more enjoyable.

H. K. CROFOOT,
Farm Bureau Manager of Cattaraugus County.

CAYUGA COUNTY

(Work begun April 1, 1914.)

The first and perhaps one of the most important things accomplished by the manager of the farm bureau was the organization of the county association, which is officered and directed by the farmers of the county, to take the place of a committee of nine men by whom the work was begun. This was accomplished by holding a series of meetings throughout the county for the purpose of acquainting the people with the functions and purposes of a farm bureau. As a result of these and other meetings the Cayuga County Farm Bureau Association was organized, and two hundred and four farmers have become members.

From April 1, to the present date, a period of eight months, the manager has been called to 271 farms in response to inquiries regarding alfalfa, soy beans, vetch, and general crops, lime and fertilizers, spraying, pruning, and care of orchards, breeds and breeding, feeds and feeding of live stock, plans for the construction of farm buildings, marketing, storage, and a large variety of questions pertaining to general farm practice. Two hundred and ninety-six farmers have called at the office with similar inquiries. A record of the correspondence shows that 2055 letters have been sent out from the office. Addresses on various topics of interest have been given at 56 meetings held throughout the county, with an aggregate attendance of 3500 persons. Six thousand six hundred miles were traveled in order to do the work.

In order that the farmers might see some of the most recent theories of agricultural scientists put into practice, nineteen demonstrations of the following description were held: three to show that by proper treatment of seed, smut in oats may be eliminated; five to show that mustard may be eradicated by the use of iron sulfate; two to show that the tent caterpillar and the codling moth may be controlled; six to study potato diseases and to discuss methods of cultivation and fertilization; one to show methods of subsoiling, ditching, and blowing up stumps and bowlders by means of dynamite; two potato seed plots to show the difference in the individuality of potatoes and to show that the yield per acre could be greatly increased by selecting the seed from the fields. In response to a movement started to improve varieties of corn in the county, fifty-two farmers stated that they would begin to improve their corn by selecting their seed from the fields.

The farm bureau had an exhibit at the Moravia fair at which over seventy-five farmers made inquiries. In connection with the exhibit the manager held a stock judging contest in which fourteen boys entered. Material was furnished for the exhibit at the State fair. As a result of suggestions made by the manager at teachers' meetings of rural schools, six exhibits have been held. The purposes of these exhibits have been

to stimulate community interest in the schools and to teach the pupils fundamental principles in agriculture.

Another line of work, which has developed from a suggestion made at these teachers' meetings, is the collection of the egg rings of the tent caterpillar by rural school children. The teachers carried the suggestion back to their schools with the result that in one district with forty-five schools an average of 1000 egg rings per school have been collected. One school has collected 3500 rings. There are approximately 500 eggs in each ring. One can appreciate the value of this work by thinking for a moment of the amount of damage that could be done by 45,000 nests of worms. This work has been in progress for only two months, and as it continues much greater results will be obtained.

An effort has been made to advertise the agricultural opportunities offered in the county. A large number of different farm products were supplied by the manager for the New York Central car, which has been sent through the Middle Western States, and which will be part of the agricultural exhibit of New York State at the San Francisco exposition. All products from Cayuga County were labeled as such. Already ten applications for facts about the county have been received from persons outside the State.

Before the formation of the farm bureau, farmers had to pay as high as $4 and $5 per ton for ground limestone. By persistent explanation of the value of and the demand for limestone, a young man was influenced to install a pulverizer and is ready to deliver at any date limestone as high in quality as any in the State, at $3 or less per ton delivered. This means a saving of from $1 to $1.50 a ton, or over $4000 in one year to the farmers of the county.

At the time of the outbreak of army worms in the southern end of the county, the manager obtained the very latest information regarding their control, and secured the assistance of two State men. Several methods of control were tried with the result that many acres of crops were saved, and valuable information for successfully combating future outbreaks was procured.

After obtaining the sentiment of the farmers regarding the establishment of a public market, the manager appealed to the common council of the city of Auburn for the establishment of such a market, assuring the council that the farmers would support a market if they were given the opportunity. After considerable discussion the council voted to open the market before May 1, 1915.

Probably there is no one thing that has been of as much benefit to the county as a whole as the establishment of the labor bureau; two hundred and twenty-six farmers have been assisted in securing farm laborers.

J. R. TEALL,
Farm Bureau Manager of Cayuga County.

CHAUTAUQUA COUNTY

When it comes to reporting actual accomplishment through the farm bureau, the work done in the improvement of the apple orchards of the county probably takes first rank. In cooperation with the apple growers' association of Chautauqua County, which was organized through the

agency of the farm bureau, a definite program of work has been carried out. This has consisted of apple growers' association meetings, orchard field meetings of apple growers, visits to individual orchards by the farm bureau manager and fruit specialists, a meeting to explain the new apple grading and packing law, a county apple show, and the distribution of information on the purchase of supplies. This work is enlisting the cooperation of about one hundred men in the county. About thirty orchards were sprayed for the first time during this year. The quality of fruit coming to the cities of Jamestown and Dunkirk has been greatly improved. The amount of barreled apples shipped from the county has largely increased, and many farms have become more profitable through this new source of income. One of the plans that has met with encouragement among the growers is the observation trip. Visits to the best-managed orchards in the county have proved very interesting and profitable.

Perhaps of second importance in actual results has been the purchasing service given by the bureau. By securing information on comparative freight rates and quality and prices of commodities, the farm bureau has been of actual money value to the county. The purchase of drain tile, apple barrels, seeds, and lime have been given most careful attention. It is impossible to estimate the amount of money that has been saved to the farmers of the county, but it has certainly been considerable. In the purchase of lime the bureau has perhaps rendered its greatest service in this field. The amount of lime used is very largely increasing, and we should keep the price of this essential commodity as low as possible. The farm bureau is cooperating with the farm bureaus of Cattaraugus and Allegany Counties, in order to secure the continuance of minimum freight rates.

By the issuing of a monthly list of live stock for sale, a definite service has been given to the farmers interested in that subject. This list was first issued in April. It will promote a better knowledge of the pure-bred stock that is available within the county, and we hope that by making it easy to locate pure-bred animals, it may supplement the propaganda work done by the farm bureau, the farmers' institutes, and the farm demonstration schools, in increasing the number of pure-bred sires at the head of herds.

Of value to many individuals have been the different forms of service, such as laying out drainage systems, suggestions on crop rotations and the laying out of fields, miscellaneous information on crops, feeds, and many other subjects.

Of lesser importance has been the work of introducing new crops. Progress with alfalfa is very slow. The bureau has called attention at various times to a few very successful growers of alfalfa, and is working with eight or ten men to secure stands.

Trials of hairy vetch as a hay crop are being made by the bureau in cooperation with farmers in several parts of the county. Results of these trials will not be available until next year. It is hoped that this hardy legume will prove itself valuable as a supplementary hay crop in the southern part of the county.

There has been throughout the year cooperation with granges, farmers' institutes, and extension schools. This year the manager gave instruction in farm management at the two farm demonstration schools held in the county. The results of farm management survey work have proved interesting at all meetings where they have been presented.

Of less importance in its immediate results, but we believe of possible value if continued, is the farm management survey work this year started by the farm bureau. The figures secured give information on how well the farms of a particular region are paying, as a rule, and the records of the most profitable farms should give information on the best way to run a farm in that particular section. The record of each farm is returned to its operator and gives opportunity for the study of the farm business, as compared to the others in the region.

During the past year the farm bureau has taken records of ninety farms in this county. While a few of these are scattered in various parts of the county, most of them lie in the region about Sherman, a typical milk-condensary region, and the results shown by these records apply to other farms located among similar surroundings. A considerable part of the effort of the farm bureau is to go into this work. While next year the major part of this kind of work done in the county will be confined to one or two localities, it is desired that this service should be extended to all those who wish to take advantage of it. The farm bureau manager will take a record of any farm in the county on request.

After the record is taken, it is carefully copied in the farm bureau office, and the labor income and other factors are worked out. A copy of the record is then returned to the operator of the farm, together with a letter comparing his farm to the average of the region, and also to the best farms in the region. This letter is followed up by a personal visit from the farm bureau manager or his assistant. Effort is made to get an expression of opinion as to whether the operator of the farm thinks any changes could be made to better his farm business, if so, as to what are the changes, and how he thinks of making them. By following up this work through several years, there is secured an actual measure of accomplishment. We can know what changes have been made and how profitable they have been.

The results of such survey work, especially when carried on over a period of years, should be of value to the whole territory where similar conditions prevail. It should create the best possible store of knowledge as to how to run a farm for profit in that region for the given type of farming.

H. B. ROGERS,
Farm Bureau Manager of Chautauqua County

CHEMUNG COUNTY

During the past year four hundred farmers were visited on their farms by the farm bureau manager or others engaged in taking records under the direction of the farm bureau. A total of six hundred farm visits were made. Two hundred and fifty farmers made business calls at the office, and there were one hundred telephone calls to and from farmers during the year.

Ten farm bureau and thirty-four school meetings were addressed by the manager, the total attendance at these meetings being 3400.

The organization of the Chemung County Farm Bureau Association was completed with a membership of one hundred.

The farm bureau assisted in the Achievement Club work carried on in this county. The manager judged potatoes and bread and instructed the children in the growing of potatoes at exhibits held last fall in the schoolhouses. One thousand two hundred children took part in this work, which included contests in poultry raising, potato growing, and bread making. All members who sent in reports during the year and exhibited their work were awarded bronze medals. The best exhibit in each school was awarded a silver medal, and the best exhibit in each supervisory district received a gold medal. The three best in the county received a gold star medal. Monthly reports were required covering the condition of the poultry and the potatoes and the progress in bread making.

Ten agricultural articles were published in the local papers, and thirteen circular letters were written. Nineteen thousand five hundred copies of these letters were distributed, and 1500 copies of Government bulletins on agriculture were given out. Three hundred survey record letters were returned to farmers. This is the means used by the bureau to give the farmers whose farms have been surveyed an idea of the condition of their business and how it compares with the best, the average, and the poorest farms in the county. The object of this work is to show the weak and the strong points of the individual farmer's business and to give him suggestions whereby he may strengthen the weak points. Two hundred other letters were written to farmers during the year.

A total of ninety schools were assisted in developing agricultural instruction, and 3000 pupils were reached by this instruction. Twenty-five books on the growing of potatoes were distributed during the year.

Under the direction of the Geneva Experiment Station, two acres of alfalfa were sown in order to determine the practicability of growing alfalfa on the hill soils of this county. These fields were limed with two tons of ground limestone per acre, and twenty pounds of seed were sown per acre. The sowing was done the last of July without a nurse crop, and excellent stands were obtained in both fields.

One cow-testing association was organized in which 409 cows are being tested for milk production. This work meets with much interest from the farmers, and especially from those selling milk that is tested for fat content or from those making butter. It is expected to reorganize this association. Several balanced rations were figured and adopted.

Through the farm bureau association about eighty tons of chemical fertilizers were mixed at home and used at a considerable less expense to the farmers in comparison to the price of commercial fertilizers. About $1400 worth of fertilizers and lime was handled through the association during the year. This work has now been turned over to the Chemung County Farmers' Exchange, a separate organization to promote cooperative buying and selling.

Three hundred farm records were taken during the year. The records taken in the county are being summarized and will be published later in

bulletin form. Twenty-two farmers in the county kept complete cost accounts, and all except two of these accounts are completed for the year. The figures on the cost of crop production from these cost accounts will be published later in bulletin form.

The main work of the farm bureau during the past year has been the taking of farm records. A system of survey schools has been started to bring to the farmers of the county information obtained from survey work. These schools are arousing much interest among the farmers, and we believe they give the farmers a better understanding of the factors that make for success in farming in the county. These meetings are held in cooperation with the county granges.

M. E. CHUBBUCK,
Farm Bureau Manager of Chemung County.

CLINTON COUNTY

It is very gratifying to be able to report at this time that there is an increasing interest in the farm bureau work in Clinton County. Farmers now know that the calls are made not to tell them how to farm or to criticise their methods unduly, but simply to cooperate with them, to help them study out any difficulty they may have, to offer suggestions that will lead to better practices in agriculture, and to give them the benefit of valuable and costly experiments by agricultural experts.

During the past year I have made over seven hundred and fifty farm calls. A large proportion of these calls were made at the request of farmers who had some definite problem that they wished to put before the manager. In addition to these personal visits, thirty-two meetings have been held, at which various subjects were discussed with the farmers. I am inclined to believe that we should have more field meetings this next year. I can see that the ones held this year have accomplished things worth while.

In addition to answering personal letters for definite information of one sort or another, the bureau has issued six circular letters containing timely information to the members of the agricultural association. Thirteen other circular letters were also sent out to small groups interested in some one thing. Several articles have been prepared and published in the local newspapers. The publishers of these papers have been ever ready to give their hearty support to the bureau.

Considerable work has been done in orchards in the way of pruning demonstrations, aid in setting new orchards, rejuvenating old orchards, spraying, grading fruit, and the like.

Owing to the success that was obtained from the treatment of seed oats for smut in the year 1913, no difficulty was experienced in getting many farmers interested in this work this last season. It is difficult to say just how much seed oats was treated for smut this last spring, but I am certain that several hundred acres were sown with seed free from the fungus that causes smut. When we stop to consider that in some fields as high as a third or even a half of the crop this last year was destroyed by smut, we can readily see that this work is something that should be pushed even harder this next season.

Considerable work has been done in trying to eradicate the common scab from potatoes. Although it is difficult to impress farmers with the importance of this, owing to the work necessary in treating seed potatoes, the farmers who did treat their seed were more than pleased with the results. I anticipate that the treating of seed potatoes will be the general practice rather than the exceptional during the coming season.

Some potato breeding was done. This work clearly demonstrated the fact that the only place to select seed potatoes is in the field when they are being dug. As a result there are many farmers in the county who have choice " hill selected " seed stock for next year's planting.

The most important work in corn this last season was the conducting of four variety tests, in cooperation with the other counties in the northern tier, for the purpose of determining which variety or varieties are best adapted for use as silage in this section. In these tests ten varieties selected with some care were used — five of dent corn and five of flint corn. In Clinton County these tests were scattered as much as possible and conducted under different conditions. At the time the corn was harvested the amount of green matter yielded per acre by each variety was calculated; then a sample of each variety was forwarded to the State School of Agriculture at Canton, in order to determine the amount of dry matter per acre. The results of this year's work plainly indicate that some varieties are much better than others for this locality, and that many farmers are not using as good varieties as they should. This work will be continued next season.

More than twenty fertilizer and lime tests have been made in the county. This work is being done for the purpose of determining the kind and the amount of fertilizer that our soils need for the most economical production of crops. Undoubtedly this work will be continued another year.

In addition to these different problems that have been mentioned, I have rendered what assistance I could to other agencies interested in the promotion of agriculture. This consisted in aiding the school superintendents to conduct a potato contest, in assisting at farmers' institutes, in helping the State College to conduct a farm demonstration school, and in getting the proper authorities interested in the soil survey that has been made of Clinton County this year. This survey, when published, will be of great benefit to the residents of the county.

During the coming year I would like to conduct more cooperative demonstrations with the farmers, which will be of interest not only to the cooperators but to all the farmers in the immediate vicinity. I feel sure that the results we can accomplish by working individually are very small compared to what can be accomplished by working with groups of farmers.

C. B. TILLSON,
Farm Bureau Manager of Clinton County.

CORTLAND COUNTY

During the first year, every effort was put forward to study the needs of Cortland County. A systematic farm survey was made of the town of Homer, which was exemplary of the needs of the entire county. The analysis of this survey determined to a large extent the projects to be undertaken, which are outlined as follows: (1) promoting work through groups

rather than through individuals by addressing meetings, by farm bureau institutes, and by a farmers' week and agricultural carnival; (2) farm home, garden, and canning clubs; (3) animal husbandry; (4) crop improvement; (5) orchard renewal.

Having determined on these projects from personal investigation during the year, the campaign was started in 1915 by addressing all the meetings of local organizations to which invitations had been received.

The manager also attended the eight farmers' institutes held in the county, and in addition held three farm bureau institutes. A farmers' week was inaugurated by the farm bureau in cooperation with the normal school in March, 1914. A three-days program for adults, followed by a day for the school children, with a round-up banquet of the holstein-friesian association constituted the program.

In order to bring the attention of the parents to the savings that might be accumulated in the farm home by allowing the children to care for a home garden, 67 members were enrolled in a market garden club.

In order to conserve the products from gardens and orchards, the canning club project was launched. The idea seemed to be well received. The housewife was quick to see the economic value to be got from vegetables, fruits, and meats laid by for use at a moment's notice, and was eager to save her labor by adopting the new and shorter methods. Accordingly, 11 canning clubs were organized that have members in 200 homes. In this work, the manager had the cooperation of the Department of Home Economics of the New York State College of Agriculture. The representative of the College, Miss Titsworth, met with each club at regular intervals, demonstrated the canning of fruits, vegetables, and meats to the women and girls, and, whenever possible, allowed the girls to do the work under her instruction.

The canning clubs were recognized by the officers of the Cortland County Fair, who offered large cash prizes for the clubs showing the largest and best exhibits of canned products at the fair. Four clubs competed for these prizes.

In the summer it became apparent that there should be some work for all the canning clubs, as a unit, to carry on. At a meeting of the presidents of the clubs in the farm bureau office it was suggested that the Cortland County Women's Club be formed, each canning club to retain its own local organization and each member to become a member of the Cortland County club. The suggestion was well received, and on September 12, 160 women and girls gathered at Riverside Park, Cortland, formed the Cortland County Women's Club, and elected the officers. This club has furthered the interest of the individual clubs.

The officers of the county club thought that they could be of great assistance to members of the canning clubs who had done some commercial canning. Therefore, a committee on uniform prices was appointed. On December 17, a sample sale was held, and 170 jars of fruits, vegetables, and meats, and 70 cups of jelly were offered for sale in the Twentieth Century Club rooms.

This fall, each canning club resolved to study under the direction of the Department of Home Economics at the State College of Agriculture. Six farm home demonstration schools have already been held, and two

more will follow. There were 201 persons registered in all the schools and 164 visitors.

As a climax to the club work an agricultural carnival and farmers' week was planned to take place in November. A special feature of this carnival was Club Day for the women. The Cortland County Potato Growers' Association exhibited over 60 plates of potatoes, which comprised one of the best exhibits ever held in Cortland County. Over $200 worth of prizes furnished by the business men of Cortland were awarded to the winners in the different clubs. In the farm exhibits, boys were allowed to compete with men, and they carried off more than 50 per cent of the ribbons. In the forty-ear seed corn exhibit, the blue ribbon went to a member of the boys' corn club.

On the evening of Grange Day, there was a "get-together" feast, and over 400 persons, including farmers, business men, and their wives, were present as guests of the Business Men's Association.

CATTLE

According to United States Census of 1910, Cortland County stands third among the counties of New York State in the value of cattle per acre. The markets are highly developed, and a great many wide-awake cattlemen are making a special business of handling dairy stock, both pure-bred and grade, which goes to nearly every State in the Union.

The farm bureau has been of service to purchasers outside the State by directing them to where they can obtain the kind of cattle they desire to buy. Previous to the campaign that started the dairy improvement association and the cow testing, there was a great deal of prejudice against testing cows for butter-fat. The manager succeeded, however, in starting three cow-testing associations during the early part of the summer. Every member of the associations delivering milk to the Borden plant has secured a premium of from 10 to 15 cents per 100 pounds because of the increased fat content of the milk. The number of cows being milked has remained about constant. The milk from low-testing cows has been fed to heifer calves reared from the best cows.

BOYS' STOCK-JUDGING CONTEST

The management of the Cortland County Fair has been very liberal, and has cooperated in arranging for the second annual boys' stock-judging contest. The inclemency of the weather during the day that stock judging took place this year, kept a great many boys from attending. About 30 boys were on hand, and between showers the different classes of stock were judged.

SWINE

During farmers' week in March, Commissioner Huson gave the boys a very interesting and educational talk on how to feed and care for pigs. At that time he offered as a prize a pair of pure-bred pigs to the boy who would make the best record in growing pigs. Accordingly, the Cortland County Boys' Pig Club was organized with a membership of 22. Of these, 8 met the requirements laid down by the farm bureau, which were to keep and submit accurate records of feed purchased and labor spent in

caring for the pigs. On November 1, reports were submitted by each member, which included all expenses as follows: cost of original pigs, cost of feed and pasture, and cost of caring for the pigs. Total receipts were obtained by having the pigs officially weighed November 1, and by calculating their value at 9 cents per pound, the market price.

All reports submitted were carefully examined, and the boy receiving the highest percentage, Harry Tayntor of McGraw, received the first prize. Mr. B. S. Winchell has offered $100 in cash to the boy who raises the best ten pigs during 1915; the same conditions are to govern the contest that were in effect this year.

POULTRY

Cortland County ranks twentieth among the counties of New York State in the sales of poultry per acre. Consequently, the farmers should give greater attention to this important industry. The farm bureau has given advice to farmers in the selection of their flocks and has also secured experts from Cornell University to help them.

The Cortland County Boys' and Girls' Poultry Club was organized at the farm bureau office. The club has had nine active members. At the end of each month, every member sends in a report giving the number of eggs his hens have laid, the price per dozen, the number of hours of labor expended, and the cost of feed.

CROP IMPROVEMENT

Through the efforts of the farm bureau, there has been a steady growth in the number of farmers who are growing alfalfa. Twenty-nine are growing this crop according to methods suggested to them. In the two years, there has been only one failure and that, in 1913, was due to poor seed.

The fertilization of meadows by top-dressing with chemicals had never been practiced to any extent in Cortland County previous to 1913, and that year the farm bureau was able to get only three farmers to cooperate in this experiment. During farmers' week and other meetings, 78 farmers purchased upwards of 400 tons of chemicals for home mixing, and caused some agents to drop the price of ready-mixed fertilizers. A good share of this was used in fertilizing potatoes and in top-dressing meadows.

The yields on fertilized and unfertilized fields on farms in different localities were determined. In selecting the fields care was taken not to get the largest increases, but to get fair, representative results. This was done by harvesting equal areas of fertilized and unfertilized plots, and by calculating the amount of the product in terms of barn-cured hay with approximately 11 per cent moisture. The chemicals used were nitrate of soda, basic slag or acid phosphate, and sulfate of potash. The average net increase from six separate acres was 4092 pounds, which if sold for $12 per ton would have brought $24.55. The average cost per acre for chemicals was $6.44, leaving a net profit of $18.11 per acre. For $1 spent for chemicals there was a return of $3.81, or 381 per cent.

A NEW METHOD OF SEEDING GRASS

There are a good many small farms in Cortland County that support large dairies. In order to enable these farmers to raise more corn, alfalfa,

cabbage, and potatoes, the farm bureau has advised them to drop out the oat crop and to do their seeding with the corn crop. This theory was not accepted by the farmers at first, but the results obtained by two practical farmers during the year 1913–1914 are causing others to feel that it is a good practice.

TREATING OATS FOR SMUT

A great many farmers followed the advice of the farm bureau in treating their seed oats with formalin. It was impossible to get any data on the comparative yields of treated and untreated plots because of the rainy season at harvesting.

LIME

The farm bureau never loses an opportunity to encourage a farmer to use lime when seeding his meadows. There probably has not been any material purchased by the farmer that he understood less about than lime. The fact that he did not understand gave unscrupulous agents a chance to bunko him all the more. Coarse, inferior limestone was in 1912 sold for any price the agent could get; cases were reported where farmers have paid as high as from $4 to $5 per ton. After a campaign in 1913, coarse limestone was sold for $1.70 per ton, f. o. b. Cortland. During 1914, 3000 tons of lime were brought into Cortland County, this amount being about equally divided between good grades of hydrated lime, ground limestone (a finely ground, superior product from the mechanical point of view), and the coarser limestones.

Already the farm bureau is in touch with one company, which is installing a large ground limestone plant at their quarries and is ready to start operations. Ninety-two per cent of the first grinding was fine enough to pass the standard, or 2500 meshes to the square inch, and analyzed a trifle better than 50 per cent calcium oxide. That product is to be sold for $2 per ton, f. o. b. Cortland.

THE RENEWAL OF OLD ORCHARDS

Before dairying was so extensively carried on in Cortland County, the farm orchard yielded a good income. For twenty years previous to 1913, the orchards were neglected. To the best of the manager's knowledge, only two men sprayed orchards in 1912. Demonstrations have been given in pruning and spraying, and in 1914 over 10,000 apple trees were sprayed in Cortland County. The farm bureau has developed the idea of spraying and has encouraged three men to do commercial work. One of these men made use of two outfits in the field during 1914. At the agricultural carnival, 117 plates of apples were exhibited.

POTATOES

In 1913 there were 2 men cooperating with the farm bureau in growing potatoes. This number has been increased to 32 men during 1914. The systematic work done by the farm bureau in cooperation with the potato growers' association has established a precedent for better work with this important crop throughout Cortland County. This association with its standard is producing potatoes the quality of which is second to none.

The tuber unit experiment emphasized the following points:

1. That there must be a full stand of plants per acre in order to realize a maximum yield.

2. That there is a vast difference in the reproductiveness of tubers selected from the bin, even when they are of the same size, shape and appearance.

3. That more even-sized potatoes were obtained where each plant was given only four and one-half feet of surface.

4. That less area per plant gave an increased yield of 105 bushels per acre on the farm of Mr. F. M. Crampton, all other factors governing the crop being the same.

The farm bureau urges every farmer to select his seed potatoes by the hill selection method.

The investigation made by the farm bureau in 1914 on 23 farms in Cortland County shows that there is an average of more than 20 per cent of inferior stock that should never be put on the market, but that should be fed to the cattle or the hogs on the farm. If a standard for size and quality should be adopted by all potato growers in Cortland County, the stock would become widely known and would be in great demand.

E. H. FORRISTALL,
Farm Bureau Manager of Cortland County.

DELAWARE COUNTY

(Work begun March 1, 1914.)

Since the organization of the Delaware County Farm Bureau on March 1, the manager has visited 452 farmers on their farms once and many of them twice. A number of orchard inspections to study diseases have been made. Two hundred and twenty-two farmers visited the office to obtain help and to discuss farm work. One thousand two hundred and fifty letters have been written in answer to inquiries. In performing this work 9840 miles have been traveled by rail and by automobile. The manager has held 38 meetings, such as farmers' institutes, grange meetings, group meetings of farmers on farms and in schoolhouses, with a combined attendance of 2450. Booths were arranged at Walton and Delhi fairs and were visited by 600 persons. The bureau assisted in arranging for two school fairs, and through its efforts four boys were awarded a free trip to Ithaca during Farmers' Week, as a prize for raising potatoes.

One of the most important projects accomplished has been demonstrating that farmers can economize on grain and yet increase milk production. It is not profitable for every Delaware County farmer to attempt to raise alfalfa, and as most of the forage now grown consists of mixed grasses, timothy, redtop, orchard grass, and some clover, so it is important that some legumes be grown to supplant much of the grain and to increase the fertility of the soil. Vetch, grown with oats or rye and cut green for hay, is better than alfalfa for Delaware County. From four hundred and eighty acres of oats and vetch grown in the county this year, there has been an increase of from three-fourths to one and one-fourth tons of forage per acre over the yield of any previous year.

Forming cow-testing associations have been one of our most important projects. Since Delaware County is a strictly dairy county, it is quite necessary that, after raising plenty of good forage, the farmers keep only cows that will return them a profit greater than the cost of maintenance. There are so many boarder cows and such a large waste of grain that it is important that some means be taken to eliminate this trouble; this can be accomplished only by using the Babcock test. At present there are five cow-testing associations in operation, and four more nearly completed. When all are in operation, two hundred and twenty-five dairies with a total of six thousand cows will be under test. The saving is at least one dollar per cow. In order to substantiate this statement, I give an illustration. One farmer in the cow-testing association said: "The third time the tester came to test my dairy, I could see that I had saved six bags of feed. The feed cost me $10.35, more than enough to pay the expense of testing and almost enough to pay the expense for six months." Again a landlord said to his tenant: "If you will board the tester, I will pay the expense of the testing." With farmers spreading the value of this work and putting it into terms of bags of feed, it is easy to organize cow-testing associations. In connection with the cow-testing work, I have been encouraging the members of these associations to use pure-bred sires, and in some instances have interested the members in purchasing a pure-bred sire for use in the associations.

Chiefly through the efforts of the farm bureau, the price of lime has been decreased, and a commodity rate on lime was obtained. Because of this, thousands of tons of lime will be used.

Tests of corn and potatoes were carried on to ascertain the value of sulfate of ammonia. No special benefit was obtained.

Tile drainage is a new phase of agriculture to many farmers, and through the efforts of the farm bureau two thousand feet of it have been laid, increasing the value of the land. The levels and the grades for this were made by the farm bureau with the assistance of the department of agriculture in the Walton High School.

Several orchards are being cared for under the direction of the farm bureau, and thousands of fruit trees were sprayed. This work is comparatively new in Delaware County.

The marketing of farm products is very important, and through the farm bureau an effort has been made to use a building in a community center as a storage house for apples, potatoes, eggs, and other farm produce. The bank in this community will give the farmers from fifty to seventy-five per cent of the market value on the produce when placed in the warehouse. When the prices advance, the produce is sold; the farmer pays his loan at the bank, and, after paying a small warehouse fee, is dollars ahead. This will tend to bring about uniformity in grading and distribution of products. It will also allow the farmer to have nearly all the money from his crop to use and at the same time will leave him in a position to take advantage of the market.

In one community an effort is being made to secure a milk plant to take care of the milk that is produced and to encourage its production. In this community the men have always obtained a living from lumbering and from working in the stone quarry; but because of poor markets they

have had to turn to farming. As it is a dairy community, it seemed necessary to obtain an outlet for milk and to encourage the farmers to produce milk, which would help bring up the fertility of the soil.

In order to obtain a closer relationship between one farmer and another, between sections, and between the people of the county and the farm bureau, a paper called *The Delaware County Farmer* is published. This paper is used to emphasize certain kinds of farming that are of interest to the farmers in Delaware County. Through the medium of this paper several animals have been bought and sold by farmers, and several men were placed on farms as laborers.

The interest in pure-bred stock is increasing through the efforts of a holstein-friesian breeders' association that has been formed.

In sections where potatoes and apples are grown for commercial purposes, potato and apple shows have been held, showing varieties and the effects of breeding.

The top-dressing of pastures has demanded considerable attention, and much interest has been shown in the work of renewing old pastures.

Reforestation has been demonstrated on several farms, and considerable attention is being given to this line of work.

One project that seems important deals with giving boys and girls an equal opportunity to stay on the farm; this is being done through boys' and girls' clubs in cooperation with the district superintendents of schools and the farm bureau. It seems to be the best way to reach many farmers, and besides it gives the boys and the girls an incentive for work and good living. Two such clubs were formed in this county, and great enthusiasm and interest has been shown, especially in fruit, vegetables, poultry, sewing, bread making, and general cooking. It engenders thoroughness, accuracy, and business ability in the young people, so that they are receiving training for their future work.

The holding of meetings in district schoolhouses during the winter months, will tend to bring about closer cooperation and will give an opportunity to reach the farmers in groups rather than as individuals.

When we can reach the farmers in groups and can get them to cooperate with us, the educational value of the farm bureau will be doubled, and the most effective work will be accomplished.

T. M. AVERY,
Farm Bureau Manager of Delaware County.

DUTCHESS COUNTY

The Dutchess County Farm Bureau was organized July 1, 1913. The work so far has been one of pioneering and of developing a spirit of cooperation.

Briefly we will call attention to what might be termed steps in agricultural progress within the county during the year, in all of which the farm bureau is deeply interested, and in the bringing of which to their present status the farm bureau has been more or less instrumental.

A freight rate of $1 per ton, reduced from $1.60, on ground limestone was secured to all stations in the county on the Central New England Railroad. This greatly encouraged the use of lime and has saved the farmers, to date, $18 per car on forty cars, or $720. Fair prices as well

as freight rates on lime have been established, so that lime is now available to all stations in the county at a price, in some cases, not over one-third to one-half the amount paid only a short time ago. Two thousand copies of a local bulletin have been printed and distributed, giving information relative to sources, rates, and the like. Since the organization of the farm bureau, at least one hundred more cars of lime have been used in the county than were used during the preceding equal period.

Following the organization of the farm bureau, there was an imperative demand for an improved cooperative purchasing and selling service. To this end the Dutchess County Cooperative Association has been organized. To date, its work has been mainly in the purchase of supplies, such as fertilizer, feed, coal, lime, and the like. Lowest wholesale prices have been obtained, and the goods have gone to the farmers at cost, only one per cent being charged by the association to cover the cost of conducting the business.

A local holstein breeders' association has been organized for the purpose of improving this breed of cattle in Dutchess County.

Two village high schools, at Pine Plains and at Millbrook, have employed special teachers of agriculture for the ensuing year, and the school authorities at Poughkeepsie are interested in the project. There was no special teacher of agriculture in the county last year. We are cooperating with both of these schools, and shall work with them on some definite projects next year.

The Arthursburg Lyceum, an association of farmers, has been reorganized after being dormant for many years.

An annual farm demonstration school has been established in the county. The first meeting was held last winter at LaGrangeville, the second meeting will be held at Arthursburg this winter, and another school has been organized at Pine Plains. This work was never taken up in the county previous to the organization of the farm bureau.

Organized cow-testing work has been started, one association operating in the town of Northeast. Much interest has been displayed in other places.

A branch of the National Housewives' League has been established in Poughkeepsie. This is a consumers' organization, which benefits both consumers and producers. It is backed by a large number of the most influential women in Poughkeepsie.

The boys' and girls' club work in the rural schools has been placed on a more permanent basis than formerly by being made more local and by the plan of holding several exhibits in the county rather than only one as formerly. This work is supervised directly by the district superintendents of schools.

Canning clubs for girls have been started at fifteen points in the county, over two hundred girls being registered. A capable instructor has given lessons in canning and jelly making to each group.

A large number of persons are trying out hardy strains of alfalfa in order to determine if possible whether or not some strains may be better adapted than others to our conditions.

More chemicals for the home mixing of fertilizer have been used during the past season than ever before. This has resulted in a great financial saving.

In 1913 the county suffered a heavy loss from oat smut. Last spring we printed and distributed 2000 cards giving directions for the control of this disease. Next spring we plan to follow up this work with a large number of actual demonstrations of how to stamp out this disease.

Directions for spraying have been given to those desiring them. A new apple insect, the redbug, appeared in large numbers for the first time last spring. We disseminated information relative to its identification and control. Farmers will be on the lookout for it next spring, and will be prepared to use control measures if necessary.

In the county, a serious potato disease is prevalent regarding which there is very little accurate information. We have arranged with the State College of Agriculture for the establishment of a field laboratory within the county next summer for the study of the disease, provided the required sum of $250 can be raised.

We have cooperated with the State College of Agriculture in the study of forest conditions in the county, and the college is preparing a bulletin giving the findings of the survey with recommendations for the improvement of our wooded areas.

We have on very numerous occasions brought State and Government experts to the county for special work and published such of their findings as would be of interest to the public.

F. H. LACY,
Farm Bureau Manager of Dutchess County.

ERIE COUNTY

(Work begun February 1, 1914.)

Although the farm bureau of Erie County has been organized for only eleven months, much has been accomplished during that time. It was necessary first to get in touch with the agriculture and the people of the county in so far as we could. The manager accomplished this by attending the local granges and other meetings, which had been arranged, and describing a farm bureau and its work.

One of the first duties of the manager was to get out an announcement, of which approximately 3500 copies have been distributed. Later a supplement was issued, of which 1500 have been distributed.

At the beginning of the growing season, a series of five orchard demonstrations were held, at which actual demonstrations of pruning, spraying, and other orchard practices, were given. The total attendance at these meetings was 189.

The manager soon learned that there was a great deal of interest manifested in the county in the starting of alfalfa. Farmers in many places who had not been successful in starting this valuable forage crop were visited on their farms, and instructions were given according to the best and latest knowledge available, especially according to the practice of the men in the county who were growing alfalfa successfully. Because so many asked the question, " What is the best kind of seed for me to procure," it was decided to procure a quantity of the hardy Black Hill alfalfa seed from the Dakotas and to try out experiments in different parts of the county, comparing this seed and its resultant crop with the

common alfalfa seed and its crop. We have sixteen such experiments. Five alfalfa demonstrations were held, with a total attendance of 196.

These meetings were followed later in the summer by eight dairy field meetings, with a total attendance of 307, and one cauliflower demonstration with 40 persons present.

During the year, 258 farms were visited where actual work was done or instruction given. As the work develops, we feel that there must be less work with the individual and more with the group.

One hundred and one meetings were addressed, with a total attendance of 7129. These meetings do not include the tri-county farm bureau picnic held at Crystal Lake, where over 3000 persons were in attendance. This was the largest purely farm bureau meeting held in the United States last year.

Arrangements were made for four farm demonstration schools in agriculture, two of which were held during the year with an attendance of 110. The one held at Hamburg was the largest in the State last year from the standpoint of attendance. The other two schools, which have been arranged, are to be held in 1915.

We are also carrying on much other cooperative work with the College of Agriculture at Cornell. Twenty-two professors and instructors from eleven departments were here during the year. Nine other specialists cooperated with us, making a total of thirty-one outside instructors for the people of Erie County during the year.

The New York State Department of Agriculture and Alfred University are also helping along various lines by sending specialists to give lectures and demonstrations.

One of the best pieces of work accomplished by the manager this year was the laying out of drainage systems on thirty-three farms. This sort of work will be of lasting benefit to those assisted. In one case assistance from the United States Department of Agriculture was secured to survey and plan an irrigation system. If this is worked out and completed, it will increase the value of many acres of land in that part of the county. One other small irrigation project is being worked on.

As Erie County ranks first in the State in the value of its poultry products, many calls have come to the farm bureau for information and assistance on poultry husbandry. As a result of these calls, fourteen poultry plants were visited with a specialist from Cornell, and questions were answered and problems discussed.

The lime question has been discussed in numerous places and on many farms. As a result several hundred tons more were probably used than would otherwise have been.

Our farm bureau helped to gather material for a farm bureau exhibit at the State Fair. We took fifteen boys to the State Fair, and thus gave them agricultural instruction for three days. Both parents and boys expressed their appreciation of the benefit derived from the trip. We had an exhibit at the county fair at Hamburg, where we got in touch with many persons who did not understand the work of the farm bureau.

We have assisted the rural school superintendents in conducting potato-growing contests with the boys and girls. At the end of these contests,

meetings were held at East Aurora and at Hamburg, and as a result eight boys and two girls have won a trip to Farmers' Week at Cornell University.

There have been about 270 business calls at the office by persons seeking information. Ten thousand nine hundred and seventy-three letters have been written and mailed from the office.

One farmers' club was organized with a membership of about 75.

We are glad to report a paid membership of 348 in the bureau.

In conclusion we feel that the greatest achievement this year has been the addition of a department of home economics to the bureau. This department commenced active operations on August 8 and has accomplished the following since that time: It has held 12 three-days schools in home economics, with an average attendance of 48 persons at each session; speeches have been made at many meetings; work has been done in connection with rural schools, bread-making contests have been conducted, and 12 home economics clubs have been organized, with a total of 383 paid members. These clubs are planning to do effective work in the future.

W. L. MARKHAM,
Farm Bureau Manager of Erie County.

FRANKLIN COUNTY

During 1914, the farm bureau in Franklin County made progress in laying a solid foundation for continued effort. Since the work was started before there were defined State policies or organized methods of control, the manager was given a free hand, but without collective support. In March, 1914, a farm bureau association was organized, but did not become active until November. Since November the membership has been increased from 35 to 150, with prospects of being doubled within a month. The county and State funds will be turned over to the association, which will control the work from now on.

The studies and observations of the work, during the nine months prior to January, 1914, convinced the manager that the potato was one of the most important crops raised in the county, especially that portion bordering on and extending into the Adirondack Mountains. During the year, effort has been made to increase the profits from this crop by securing better quality and larger yields. As a means of accomplishing this, it was decided that the heredity of the tubers used for seed offered by far the greatest chance for improvement.

While many of the growers used carefully selected seed, the majority still used the planter size, or small potatoes taken from the bin. These small potatoes have practically no market value, save labor in preparation, and give as good or better stands under careless planting; therefore the cost of planting is somewhat lessened by using small seed. Most of these small potatoes come from the poorest hills, because the best hills have few, if any, small tubers. Low yielding, weak and diseased hills furnished most of the parent stock when small seed was selected from the bin, resulting in poorer yields, increased amount of culls, spread of disease, and quick "running out of the seed." This was followed by buying from agents or through catalogues high-priced seed, which has been shown

in every case examined to contain diseased tubers and on the whole to be of very inferior quality. Some of this was found to be so diseased and rotten that the company was required to replace all lots brought to the attention of the farm bureau. The manager of the bureau could have directed the purchasers to neighbors having superior seed of the same variety for sale at one and one-half cents per pound, or one-fifteenth of the price paid the seed house.

With the above conditions in mind, effort was made in meetings held throughout the county to induce the growers to select tubers from their best yielding hills for a seed plot. A few growers did this in 1913, but many more, as a result of the winter meetings, selected one hundred or more of their best tubers from the bin and planted them by the four-hill unit system. During the summer, fifteen potato field meetings were held, in several instances in demonstration fields, where emphasis was placed on the individual hills for seed. In some cases, while the tops were green, the manager marked undesirable hills in a section of the field, and the grower saved the hills not marked if desirable when dug. This is an easy and rapid method of eliminating top diseases, mixed varieties, and poor plants on a larger scale of seed selection. The results of these meetings, of circular letters, and of other means of improving the crop have been very gratifying; hundreds of farmers have hill selected stock for planting at least part of their crop next year.

It was believed that the quickest and the most effective means of creating interest and of obtaining figures would be by means of a boys' and girls' potato contest. With the cooperation of the district superintendents of schools, a quarter-acre contest was organized, with 105 contestants. Our first annual Corn, Potato, and Nature-Study Show is now past history, but the interest created by that show and contest will make future history here, and it has already borne fruit by making a big contest and show possible for 1915. The high quality of the exhibit has set a new standard before the growers who saw the exhibit and attended the two-days program. The facts and figures brought out by a study of the reports proved that the contestants who treated their seed, sprayed with bordeaux mixture, and had good seed were the ones who stood highest in score.

While our best growers use about 1000 pounds of commercal fertilizer per acre, the average amount used is about half this. With this low fertilization and without spraying, our yield per acre leads the State; according to the last United States Census the average yield for Franklin County was 197 bushels per acre, or 74 bushels more than the average for the State. This yield is believed to be due largely to the soil and the climatic conditions of Franklin County. The potato project will remain the major one for 1916; the work under way will be enlarged and continued.

During the summer of 1914, the farm bureau organized and cooperated in conducting the following contests: collecting tent caterpillar egg rings, a one-acre corn contest, a nature study contest, and a quarter-acre potato contest. A girl won the individual prize by gathering 23,000 egg rings, and the winning school gathered 190,000 egg rings. The corn contest was won with a yield of 64 bushels of fire-dried shelled corn. A girl four-

teen years old won the quarter-acre potato contest with a total score of 97.3 and with a weighed yield of 131.4 bushels of clean, marketable potatoes. The nature study contest was under ten divisions, and was won by different rural schools.

A corn variety test was conducted in northern New York by the county agents of Jefferson, St. Lawrence, Clinton, and Franklin Counties, cooperating with the State School of Agriculture at Canton, and the Northern New York Corn Growers' Association. This test is being made with five varieties of flint and five varieties of dent corn, in order to determine what type of corn will give the most food nutrients per acre for silage purposes. The seed was furnished by the corn growers' association, and the dry matter and chemical tests are being made by the agricultural school at Canton. This test is to be continued, and the results found should be of great value to the dairy farmers of the four counties. The acre contest will be again conducted in order to improve the seed corn and in order to determine whether it is advisable to produce our supply of dry corn instead of purchasing it from the West.

Lime and fertilizer tests and demonstrations will be continued, especially the top-dressing of meadows. The work so far has shown that nitrate of soda alone applied at the rate of from 100 to 125 pounds per acre has been the most profitable fertilizer on hay for the season during which it was applied. The cost of growing the hay in excess of the checks, ranges from $4.50 to $5 per ton.

During the year the manager has addressed 79 meetings, having an attendance of about 5816 persons, has written about 450 personal letters in reply to inquiries, has issued 10 circular letters, has enrolled many persons in the Cornell Reading Courses, has assisted in 7 farmers' institute meetings and in 2 extension schools, has spoken at 6 rural teachers' conferences, has distributed hundreds of agricultural bulletins to persons interested, has operated a traveling agricultural library of 140 selected books, and has made about 450 farm calls, reaching 231 different persons. Trial tests are being made introducing winter vetch with oats and hay as a forage crop and soy beans in silage corn. Where requests were made, aid has been given in inoculating and preparing soil for alfalfa. Hardy varieties of these legumes have been secured, and time will determine the value and the place they may have in our agriculture. Besides the things mentioned, the manager's time has been well occupied with the necessary routine demands for reports, collecting information, answering telephone and office calls, and the like. Educational exhibits were made at the county fair and the corn and potato show, and a collection of plant diseases, weeds, seeds, chemicals, fertilizer materials, insects, and the like, were displayed at the farm bureau office when not used to demonstrate points at the meetings.

The granges, the school superintendents, the county supervisors, and the public have cooperated in any project put forth by the farm bureau, and the manager is indebted to all these agencies for whatever results he has been able to accomplish.

O. F. ROSS,
Farm Bureau Manager of Franklin County.

HERKIMER COUNTY

As is no doubt clear to all who have considered the character of the work carried on by the farm bureau, results that can be counted in dollars and cents are bound to come slowly. We believe that the work of the farm bureau has already been of much financial benefit to the county, but we also believe that its good results will be multiplied many times in the course of a few years, for as time goes by a greater number of farmers will carry out the practices that our work has shown bring increased profits.

The manager has attended 43 meetings, practically all of which were held during the winter and the early spring. The farm bureau has listed the names of about 600 men whose farms have been visited during the past two years; many of these farms have been visited a number of times. This is about one-third of the farms of the county. Over 500 men have called at the office of the farm bureau manager during 1914.

LIME

The use of lime is a practice that has been encouraged by the bureau, and the results so far have more than justified the strongest claims we have made. An acid soil is unfavorable to the growth of clovers and timothy, and these are among the most important crops grown in this county. In the case of timothy, we find that more acres are in timothy than in any other crop grown in the county. The addition of lime to a timothy field that is in an acid condition, will increase the yield of timothy 30 per cent. When we consider that one application is sufficient for six years, we find that the cost of liming an acre, about four dollars, is a good investment. In 1912 about 200 tons of lime were used in Herkimer County. In 1913 the farm bureau carried on demonstration work in alfalfa, which made necessary the use of lime, and over 600 tons were used during that year. That the farmers of the county have found that the use of lime paid them, is proved by the fact that the farm bureau has records of over 2000 tons of ground limestone used in the county this year. The experience of many men who have used lime is that it doubles the growth of clovers and alfalfa.

ALFALFA AND OTHER LEGUMES

During 1914 the farm bureau has continued the alfalfa work started in 1913, and we believe has proved that it is possible to grow alfalfa in Herkimer County on a large scale.

The four things necessary for success with alfalfa are good drainage of the soil, fertility, lime, and inoculation.

Spring seeding has been practiced in the majority of cases, and a nurse crop has generally been used. During the early part of this month a form letter was mailed to about 65 men who seeded alfalfa in 1913, and replies from 31 of these men have already been received. These 31 men have over 200 acres of successful alfalfa, and we believe that the work of this year will very greatly increase this total, as the growth of alfalfa during the past season has been very good.

Other legumes in which work has been done are vetch and soy beans, and good results have been obtained with these crops.

Clover is one of the most important crops grown in the county, and a large part of the lime used during the past years has been applied with beneficial results to oat ground for the next year's seeding.

SPRAYING FOR MUSTARD

In order to eradicate mustard seventy acres of oats and corn were sprayed under the direction of the farm bureau with 100 pounds of iron sulfate per acre. The cost of this was not over $1.50 an acre, including labor. One man says he believes that he made $175 by spraying a field of corn at an expense of less than $10. Other fields sprayed show equally favorable results. We believe that mustard can be completely eradicated in a few years by systematic spraying by the farmers of the county.

CORN DEMONSTRATION

The corn demonstration work of the farm bureau during the last year was very successful, and every field ripened corn. The average yield was 150 bushels of ears per acre. Only State corn was used, as we believe this gives surer returns.

COW-TESTING ASSOCIATION

Sixty dairies have been tested during the past year in the cow-testing association work. The men who have completed a year's test are without exception well pleased with this work. It will be carried on during the coming year. One of the largest parts of the correspondence of the manager has been in regard to the computation of dairy rations; over 200 books on this subject have been given out by the bureau. This is work that can be done by the farmer equally as well as by the manager, and it has been our effort whenever a ration is balanced to show the man how to do the work himself. In one case a man saved over a dollar a day in feed, and produced fully as much milk through using rations recommended by the bureau manager.

TILE DRAINAGE

About ten miles of tile have been laid in this county during the past year, and the farm bureau has superintended this work to the extent of arranging for the purchase of tile and surveying the areas to be drained.

ORCHARDS

Herkimer County contains a great many small orchards, which return little or no income to the owner. These orchards need pruning badly, and must be sprayed in order to yield a good quality of fruit. During the past year over 4000 apple trees have been sprayed under the supervision of the farm bureau.

Trees were pruned in the spring to remove dead wood and to open up the tree, in order to permit the sun to reach the inner branches and thus to enable fruit to be borne all over the tree. A dormant spray was then applied. A second spray was applied for the control of codling moth and scab as the petals were falling, and, in most cases, a third spray was applied about ten days later. The men who have sprayed state that larger, more abundant, and better fruit free from insect blemishes was obtained.

MEADOW FERTILIZATION

The system of farming practiced by the farmers of the county makes it necessary that a considerable portion of the farm be held in grass for several years. Farmers often find it difficult to maintain a good stand of timothy, and the general experience is that the yield decreases each year. The farm bureau has carried on demonstration work in the fertilization of meadows, and the results have been so striking that we hesitate to say that equal returns can be obtained every year. The mixture used for fertilizing has generally been 100 pounds nitrate of soda, 150 pounds acid phosphate, and 25 pounds muriate of potash, per acre. The total cost of fertilizing an acre, including labor, is about $6, and the returns have ranged from $10 to $15 per acre.

M. E. CHUBBUCK,
Farm Bureau Manager of Herkimer County.

JEFFERSON COUNTY

During the past year the bureau has continued its former lines of work throughout the county and has met in every instance with the hearty cooperation and assistance of the farmers, individually and collectively. It is a well-known fact that we are just now entering a decade that will witness many changes tending toward greater agricultural activity and an increasing appreciation of agriculture as a business. The organization of a farm on a strictly business basis is of vastly more importance than having good cows or good crops. Wide-awake farmers are beginning to appreciate more and more the importance of well-organized farm business. Hit-or-miss farming has never been profitable and should be discouraged as a matter of policy.

The field activities of the bureau are confined largely to tests and demonstrations and to visiting farmers who express a desire to carry on some definite lines of work that may result in better farm practice and more profitable farming. Our present list of cooperators includes 466 farmers in all parts of the county. Our plan has been to illustrate a principle through the agency of field demonstrations as much as possible, because more men can be reached in this way than by personal visits, and, furthermore, a field demonstration is more convincing than a talk.

During the past year the manager of the bureau has taken part in 99 different meetings and field demonstrations and has thereby come in contact, directly or indirectly, with approximately 6680 persons within the county. The auspices under which these meetings were held may be classified as follows:

Forty-seven meetings under auspices of the farm bureau, reaching 1595 persons.

Thirty meetings under auspices of subordinate granges, reaching 2554 persons.

Twenty-two meetings under auspices of farmers' institutes and other local organizations, reaching 2532 persons.

This indicates, in a way, the interest taken in the farm bureau by the subordinate granges and other local organizations in the county.

The Jefferson County Farm Bureau Association was formally organized at a public meeting held in Watertown, March 6, 1914. The methods

of work and the policy of the farm bureau are subject to the direction of the executive committee of this association. The membership of this association already includes representative farmers from all parts of the county. Naturally, the strength and the usefulness of the association will depend on the number and the active interest of the members. Any farmer in the county who believes in the farm bureau as an institution that will carry out the wishes of the agricultural class and will promote such activities and enterprises as the farmers themselves want, is encouraged to join the association and to take an active part in helping himself or, what is more important, in helping his neighbors.

The bureau has been of assistance to the farmers during the past year through its labor exchange, through which it has received 136 requests from farmers desiring farm laborers. To meet this demand we have received at the office of the bureau applications for work on farms from 164 laborers, a majority of whom live in this county. We feel that this work has been appreciated.

In cooperation with the State College of Agriculture a circular has been published setting forth the agricultural advantages of Jefferson County. Five thousand copies have been distributed.

During the past summer, the manager, in cooperation with the State College of Agriculture, made a careful study of the factors that affect cost and profits in milk production in this county. The investigation was based on the individual records of the cost of producing milk from 834 cows from all parts of the county. Space does not permit the presentation here of the findings of this investigation. It is sufficient to say, however, that after figuring all expenses involved in the production of milk, we find that for Jefferson County a cow that produced less than 4000 pounds of milk in one year is not profitable, and the degree of profit or loss is proportional directly as the cow produces more than 4000 pounds or less than 4000 pounds of milk when the average market price for the year is $1.52 per hundred pounds.

The bureau has continued its local studies and field demonstrations relating to the fertility problems confronting the farmers in the hay-growing sections of the county. Information relative to the use of chemical fertilizers for growing market hay with profit was gathered from actual results secured on different farms where farm manure is not available, and was published in our local bulletin No. 3, entitled "Growing Hay for Market." In brief, our field demonstrations covering two years on 16 different farms show that for an average investment of $5.90 in chemical fertilizers an increased yield of 1800 pounds of dry hay was secured, to say nothing of the beneficial residual effect of the fertilizers on succeeding crops.

The bureau is also continuing to advocate the more general use of leguminous crops in the average crop rotation, because leguminous crops materially increase the fertility of the soil and also tend to reduce materially the expense in connection with purchased foodstuffs. On this phase of our work, the bureau has issued local circular No. 5, the title of which is "Winter Vetch as a Supplementary Farm Crop in Jefferson County." The bureau has been instrumental in causing hundreds of acres of this crop to be seeded during the past season.

It is a fact not commonly appreciated by many farmers that we already have in the county varieties of oats, potatoes, corn, and other farm crops, that are equal to any that exist. The bureau is constantly urging farmers to improve the varieties that they now have by seed selection rather than to seek annually elsewhere for new and untried varieties of seed recommended in the main by those who have something to sell.

We note with satisfaction the growing interest in matters pertaining to improvement in the breeding of live stock. Each year more and more dairy farmers are following the simple practice of keeping records of the milk produced by individual cows in their herds. This is one of the most important lines of work that will lead to greater profits from the dairy. It is accomplished in two ways: either by joining a cow-testing association, or by purchasing a spring-balanced milk scale and recording each day the milk produced by each cow. The yearly elimination of from three to five of the poorest cows in each herd would mean the saving of thousands of dollars to the dairymen in this county.

In close cooperation with the district school superintendents and with the subordinate granges in the county, this bureau has continued its work of encouraging farm boys to take a greater interest in the farm. This includes our farm boys' acre corn and potato club work. During the past year we have registered nearly 200 boys, under 19 years of age, in this work. This year 6 of the boys in the corn contest made yields averaging over 60 bushels of dried shelled corn per acre. The largest yield was 72 bushels per acre. In the potato contest one boy 15 years old grew 364 bushels of potatoes in one acre. These boys will be the farmers of the future. The value of this work cannot be overestimated.

There are many other phases of work that this bureau is encouraging and promoting with a view to being of service to the farmers of the county and to increasing agricultural welfare within the county.

In conclusion, it should be clearly understood that if the farm bureau is to attain its maximum usefulness, the work done by the manager of the bureau must be very largely outlined and directed by the farmers of the county. This direction can best be given through organized channels. The Jefferson County Farm Bureau Association is the first step toward this end. Every active farmer who is interested in the betterment of agricultural conditions in Jefferson County should affiliate with this association.

F. E. ROBERTSON,
Farm Bureau Manager of Jefferson County.

MONROE COUNTY

The work of the farm bureau in Monroe County has changed considerably in character since my last annual report. During the first year of the farm bureau most of the time of the manager was employed in visiting individual farms, getting acquainted with the people, and giving individual advice. Since that time there has been an increased demand for the services of the bureau, and in order to reach many fruit growers and general farmers in the county it was necessary to hold demonstration meetings instead of trying to visit each farm separately.

Judging from the attendance at these meetings the farmers of Monroe County are interested in the bureau. For example, every one of the pruning demonstrations except one occurred on a stormy day, but the attendance averaged nearly forty, reaching as high as ninety at one meeting.

At the demonstration meetings it is not the policy of the manager to do all the work, for this would not give the best results. The township committeemen are depended on to advertise the meeting in their local papers, announce it at their granges, and if necessary make use of their telephones. This places the responsibility for the success of the meeting on the committeemen and those asking for the demonstration. Not only are experts made use of, but some of the best local fruit growers are called on to give their opinion or to give a demonstration themselves as to how the work should be done. This creates local interest.

It is in the best interest of the farm bureau to cooperate with other existing organizations. The New York Central Railroad cooperated with the bureau in holding a potato field demonstration, an apple packing train, and a "hog special." The attendance was particularly good at each meeting, and although the railroad received the chief credit, as it should, the fact that the farm bureau cooperated was not lost sight of.

The drainage demonstration held at Webster in cooperation with some of the largest ditching machine companies showed what could be done when working through township committees, for there were 550 persons present.

It has been impossible to work among the schools as much as during 1913. This is to be regretted, because it is a big field and there are but few rural school-teachers who are well enough acquainted with agriculture to instruct the farm boys and girls in nature study or agriculture.

The farm bureau did comparatively little work in the potato sections of this county during 1913, but sixteen potato-spraying trials, or demonstrations, for the control of the late blight of potatoes were held. This took considerable time, but it brought the manager in contact with many of the potato growers in the southern part of the county, and, I think, strengthened the farm bureau there.

The work on the control of cabbage aphids, while not entirely successful, demonstrated many facts about the difficulty of controlling this insect.

The exhibit at the Rochester Industrial Exposition, which took two weeks, accomplished good in giving information in regard to the nature of diseases, insect troubles, and the like, in the county and also in regard to the apple packing laws. Many persons learned for the first time that there was a farm bureau in Monroe County.

Although not all was accomplished that was expected in January, 1914, yet there is some cause for encouragement. It was hoped to enroll at least five hundred members in the bureau, and a few short of four hundred were received. But the membership is made up of some of the best farmers and fruit growers in the county, so that the bureau is likely not only to retain this membership next year but to secure many new men in each township.

It is necessary for the development of any farm bureau to depend on committeemen in each township. In order to strengthen the bureau

further in 1915, there will be from three to five men scattered over a township, whose chairman is a member of the advisory council. It will be the duty of each man to voice the needs of his committee. He will feel greater interest in his community, and, if properly selected, can help to increase the membership.

A farm bureau bulletin will be issued beginning with the new year. Although this will take considerable time, the manager can by this means keep in closer touch with the members and they with each other. It will also give something more to each member in return for his $1 membership fee than to those who are not connected with the farm bureau but yet have been able to attend all the meetings.

Since Monroe County is one of the most progressive agricultural sections of the State with communities where there are many expert growers of apples, potatoes, beans, market garden truck, and the like, there is difficulty in outlining any general policy for the farm bureau that will apply to the whole county. However, a farm bureau, when once it becomes established in one of the most progressive counties in the State, can do much good.

L. A. TOAN,
Farm Bureau Manager of Monroe County.

MONTGOMERY COUNTY

(Work begun March 1, 1914.)

The first work consisted in studying the types of farming practiced and the agricultural possibilities of the county, in explaining to the people the functions of the farm bureau, and in arranging for cooperative work with the farmers.

The first demonstration work was given in the pruning and spraying of several apple orchards. Each of these orchards served as an object lesson for the people in that community. The results were all that could be desired, and all the fruit found a quick sale in the local markets at the highest market price.

Information was given regarding the treatment of seed oats for smut. A few farmers treated their seed oats with a solution of formaldehyde before sowing, and they harvested a crop free from smut. Many of their neighbors' oat fields, which were sowed with seed not treated, were so full of smut that at threshing time the dust coming from the barn looked like smoke from a newly started soft coal fire. The oats grown from the treated seed also yielded more, and the straw was of better quality. These demonstrations were so convincing that all the farmers with whom I have talked regarding the matter state that they will not sow oats next spring without giving the formaldehyde treatment.

The farm bureau has encouraged the growing of alfalfa, as a farm crop, to supply a feed high in protein and to allow the farmer to reduce or eliminate some of his feed bills. All fields of alfalfa seeded in cooperation with the bureau have gone into the winter in excellent condition.

When the farm bureau began work, the lowest price that could be obtained on ground limestone for this county was $2 per ton, f. o. b.

Canajoharie. Through the efforts of the farm bureau this price has been reduced to $1.50 per ton for the same quality of limestone, f. o. b. Canajoharie. Much information and many suggestions have been given regarding the use of lime. More ground limestone has been used in this county the past season than ever before. Many farmers are planning to haul carloads of it to their farms this winter for use next spring. Ground limestone guaranteed to pass a 14-mesh screen can now be delivered at any station on the West Shore Railroad at a maximum price of $1.85 per ton in carload lots. The results from the use of lime on timothy, clover, alfalfa, and other crops, has been very encouraging.

Grasshoppers became a pest in a locality in the western part of the county last summer. Inspection of the infested area was made, and the bureau then kept in daily communication with a representative there. When it was evident that the pest was increasing and becoming a serious damage to crops, the State Department of Agriculture in Albany was informed of the danger. The next morning two representatives of the department were sent to assist in exterminating the grasshoppers. One hundred and sixty-eight acres were covered with poison bait paid for by the department, and in three days the grasshoppers were under complete control. This is just one instance of how quick action at the right time proved effective.

A farm bureau exhibit was given at the county agricultural fair. The purpose of the exhibit was to show and explain some of the work accomplished by the bureau, to give agricultural information, and to arrange for cooperative work with those farmers who desired it. The manager met several thousand persons, and many requests for cooperative work were booked through the efforts of the farm bureau in cooperation with the agricultural fair association. Exhibits from the Departments of Farm Crops and of Plant Pathology at Cornell were secured for the county fair.

The farm bureau is of the firm opinion that Montgomery County can produce as good stock, seed, and farm products as can be obtained in the market. In order to provide a means for advertising these products and also in order to give the members of the farm bureau opportunity of making their wants known, a monthly publication, called *The Farmers' Exchange and Labor Bureau*, has been established, in which each member of the farm bureau association has the privilege of advertising free of charge any stock or farm products he may have for sale or of describing anything he may wish to purchase. It is a simple and effective means of bringing buyer and seller together and keeping business at home.

Through the efforts of the farm bureau, demonstration schools in agriculture and in home economics were held in Fort Plain during the week beginning with December 14. These were the first extension schools ever held in this county. At the close all the students acknowledged they had been well repaid for the tuition fee charged and for their time in attending. All signed a petition requesting a similar school another year. Much credit is due the local correspondent who managed the schools to the satisfaction of both students and instructors. It is doubtful if any farm bureau help will be needed to secure extension schools for this neighborhood next year.

Business visits have been made to 287 farmers, including 205 different farmers. The majority of these calls were made at the request of the farmers. Much information on various farm subjects has been given. The manager addressed 40 meetings, which had a total attendance of 3003.

The membership in the farm bureau has almost doubled during the past nine months. The number of farmers asking the bureau for agricultural information is increasing. More farmers will cooperate with the bureau next year in some definite work. The prospects for farm bureau activities in 1915 are good. The work will be more specific.

ALLEN S. MERCHANT,
Farm Bureau Manager of Montgomery County.

NASSAU COUNTY

(Work begun August 1, 1914.)

Because the Nassau County Farm Bureau was not started until August 1, 1914, and on account of the peculiar conditions in the county, the committee first advised the manager to spend several weeks in traveling about the county. This plan was followed, and the manager talked with farmers and others who were well acquainted with conditions on Long Island. This careful study showed that Nassau County is unique, in that it is made up of urban, suburban, and rural classes of people. There is probably more wealth in Nassau County than in any other suburban county in the State, and perhaps in the United States.

Land is valued as high as $1500 per acre. Of course it is difficult to conduct a farm on a paying basis with such a large investment. Only the most intensive farming can be practiced. The estate holders and many of the gentlemen farmers, however, do not care for profits from their farms but simply enjoy growing the best crops and keeping purebred stock for exhibition purposes. Most of these men and their managers have welcomed the organization of a farm bureau in Nassau County.

The farmers who still operate their own farms have made use of the farm bureau in many ways. Unfortunately for the general good of agriculture these men are rapidly selling their farms, or are renting them to foreigners, principally Poles, who use intensive farming methods, but who resist rather than aid any cooperation or organization. These men need the help that the farm bureau can furnish, but until we can find some means of overcoming suspicions, which they seem to have of all enterprises promoted by Americans, the bureau can be of very little help to them. The manager has visited a large number of these men in order to explain the purposes of the farm bureau. Some of them have attended the meetings, but very few have ever asked for a visit from the manager.

A brief summary of this and the other work of the past five months follows:

The manager has made approximately 308 farm visits for the purpose of assisting in agricultural work, such as seed corn selection, alfalfa growing, purchasing of seed, lime, fertilizer, live stock, and the like, controlling

plant diseases and insect pests, renewing old orchards, poultry management, poultry house construction, and general farm management. He has visited 45 schools for the purpose of promoting nature study and boys' and girls' club work, and of explaining and distributing printed information on the threatened attack of the gypsy and the brown-tailed moths. He has addressed 10 meetings in different sections of the county in addition to group meetings. These group meetings, which were well attended, were practical demonstrations on the uses and the comparative values of lime and the nature of potato diseases with methods of prevention or control.

The farm bureau also conducted a successful educational exhibit at the Mineola Fair, which was visited by a large number of persons. This gave the manager opportunity to talk with many persons, of whom over one hundred asked him to visit their farms as soon as possible.

In cooperation with various agricultural institutions, the farm bureau successfully conducted a canning demonstration at Mineola and a cooking demonstration at Port Washington.

An arrangement was made with the district superintendent of schools whereby the farm bureau was permitted to have a part in the two conferences that included practically all of the teachers in Nassau County. Through the efforts of the farm bureau, the State entomologist and the State nursery inspector on Long Island, as well as the manager, addressed this meeting on the subject of harmful insects that are found or that may soon be found in Nassau County.

The manager has secured the help of ten experts on special problems.

Much has been saved to the farmers of the county by giving them advice on diseased crops and by securing better prices on lime, fertilizer, and the like.

Some of the things that have been accomplished have been given, but, because of the short time of its existence, the work of the Nassau County Farm Bureau should not be compared with that of other bureaus that have been in operation for a much longer time.

Of the many problems that present themselves in Nassau County, the following seem to need special attention; social, school, cooperative marketing, cooperative buying, and the maintenance of the humus supply in the soil.

When the farm bureau was organized in this county, there were no granges, and there was only one farmers' club, which was practically dormant. The farm bureau and the officers of the Suffolk County Grange have cooperated in organizing what appear to be two strong granges, one at Hicksville and the other at Massapequa.

The group meetings that the farm bureau has conducted in several schoolhouses, seem to have been popular and to have accomplished much good, not only in giving out information but in getting the people together to discuss their own problems. This is the best way to get local problems solved. A continuance of these meetings, together with good grange meetings, ought to go a long way toward improving the social conditions of the county.

Very little work has been done in regard to school and home gardens. The back-yard garden problem is one that needs careful attention. The

farm bureau and the district superintendents of schools are working together in mapping out a plan whereby all of the children in the county will be given an opportunity to study or at least to hear something of agriculture. The boys' and girls' club work will be reorganized and wherever possible school gardens will be instituted. In visits with the district superintendents to over forty schools in the county, it has been found that the teachers are very willing to cooperate. The canning demonstration, given under the auspices of the farm bureau by Professors Graham and Benson, has certainly aroused some interest in boys' and girls' club work. The State School of Agriculture at Farmingdale, when it is completed, should go far toward solving the school problem on Long Island.

In order to get in touch with market conditions, the manager has gone to the markets with the farmers for the purpose of finding out the conditions existing there. The villagers are not getting a sufficient supply of fresh vegetables, and it is hoped to remedy this in part by bringing about the establishment of some local distributing point where a farmer may sell a load of produce for cash and return at once to his farm. There is too much duplication of work in carrying produce to the New York and the Brooklyn markets.

Some well-organized work should be done in the cooperative buying of seeds and supplies, which the farm bureau has already fostered in a small way. No doubt the granges will render much assistance in this respect.

The question of the economical purchasing and of the judicious use of fertilizers and lime, needs careful consideration. Large quantities of commercial fertilizers have been and are being used, often times at a loss, because of the farmers' incomplete knowledge of the fundamentals of fertilizing soil. The use of lime is growing in favor, and wherever used marked results have followed because most of the Long Island soils are acid. Of course, potato growers need to be very careful in using lime.

Long Island soils need more humus. Some of the most successful farmers keep live stock; some purchase New York stable manure, which is becoming a very expensive practice; while some grow leguminous crops. There are too many farmers who do not add humus to their soil by any farm practice. The farm bureau advocates keeping more live stock and growing more legumes. More cows are needed in Nassau County, for there is an excellent local market for milk, and there is much need of the manure to supply humus. The farm bureau also recommends that farmers cease to burn their potato vines unless they are diseased, for these would make humus.

Demonstrations on the most successful farms will be conducted, and plans already started in securing the cooperation of farmers to conduct practical tests on their farms under the direction of the farm bureau will be followed out. The farm bureau expects to organize and complete a farm survey this spring. It is desired to get some data as a basis for further work in farm management and farm practice.

LLOYD R. SIMONS,
Farm Bureau Manager of Nassau County.

ONEIDA COUNTY

ORCHARDS

The work of the bureau during the first year was centered on several orchards that had long since begun to decline. This work was continued during the second year, and several new cooperators were added to the list. Eighteen men cooperated in this work with the farm bureau for one year.

The orchards that were carefully tilled, as well as carefully pruned and sprayed, have given the best net returns. The apples from the better orchards have been packed, for the most part, in bushel hampers and have nearly all been sold in the local markets at prices ranging from 60 cents to $1 per bushel, the price for fruit guaranteed to be ninety-five per cent perfect and of a size not less than two and one-half inches in diameter, the minimum for New York "Standard A" grade apples. In these orchards it was easy to grade and pack this kind of fruit, since more than ninety per cent had a diameter of more than two and one-half inches and were free from scab and worms. Apples packed in hampers sell readily at a much better price than that paid for the ordinary run of apples that go into the local markets in crates and often in bags. One crop of 1800 bushels was sold at a net profit of $704.35.

Through the work of the farm bureau cooperating in different orchards and as a result of meetings, personal visits, and articles published in newspapers, it is safe to say that 8000 trees in the county have been sprayed this year that were never sprayed before.

MEETINGS

During the year the farm bureau has held meetings in various parts of the county. Besides these, two general county meetings have been held in Utica with several hundred persons in attendance. Some of the subjects discussed were lime and liming, rations for stock, fertilizers, orchards with special reference to the renewal of old orchards, and spraying potatoes with bordeaux mixture. Nearly all subjects of interest to the farmer have been treated at the different gatherings. The meetings have been held in open fields, farmers' homes, and town halls. The total number of meetings held was 30, with an average attendance of 79.

The accompanying table shows the number of visits made to individual farmers in the different towns, the subjects under discussion, and the type of cooperative work undertaken. The estimated number of callers at the office was 300; inquiries by mail and telephone, 2000; total visits to farms, 577.

ASSOCIATIONS

Among the most important organizations are the cow-testing associations, of which there are four. These associations are doing excellent work, and letters come in repeatedly from members, speaking in the highest terms of the results accomplished. There are, at present, approximately 2500 cows being tested by these associations. Wherever

	Corn	Cow testing	Trucking	Alfalfa	Orchard	Drainage	Farm management and accounts	Lime	Farm renovation, general	Farm sales	Dairying	Soy beans, vetch, and rye	Potatoes	Fertilizer	Barn plan	Miscellaneous	Weed extermination	Grasshoppers	Total
Annsville				13	2	1		2	3			1						5	27
Augusta		24		6	1								2						33
Ava		8		3															11
Boonville													2						2
Bridgewater		5																	5
Camden				12		1											1		14
Deerfield				8															8
Florence																			0
Floyd				5									1						6
Forestport									1	1						1			3
Kirkland		11		1	52		3		1				3			3			74
Lee							1												1
Marcy		3											1			12			16
Marshall		12																	12
New Hartford	4		2	5	32		1						1			11			56
Paris				11	32		3		2	2			12			4			66
Remsen																2			3
Rome		22		1	1		1						2			1			28
Sangerfield	1	11		1	4	1	2		1							1			22
Steuben		1																	1
Trenton		8		7	1					1	1					10			28
Vernon		43		8	2	1						1				2			57
Verona		25		4	4	1	1							1	1				37
Vienna				1		1						2			1				5
Western		8		1															9
Westmoreland					2														2
Whitestown				1	35		1						8	1	1	4	1		52
	5	181	2	88	168	6	13	2	8	4	1	4	32	2	3	51	2	5	
Grand total																			577

possible, the farmer weighs the milk each day. The tester visits the farm one day each month, weighs the milk, tests it for butter-fat, weighs the feed, computes from the result the cost of maintenance and the net revenue. By this method every cow stands on her own merit, and the "robbers" and the "boarders" can easily be separated from those that pay. The results found in two associations that finished their year in April, 1914, follow. The returns from cows in the best and the poorest herds are shown in the following table.

Average per cow	62 cows in 6 best herds	89 cows in 6 poorest herds	5 best cows in each of 6 best herds	5 best cows in each of 6 poorest herds	Best cow in each of 6 best herds	Best cow in each of 6 poorest herds	Return for extra feed consumed by good cows: 5 best in each of 6 best herds	Best cow in each of 6 best herds	5 best in each herd of 6 poorest herds	Best cow in each of 6 poorest herds
Milk, pounds	7,929	5,271	9,501	6,524	11,286	7,330	1,572	3,357	1,253	2,059
Fat, pounds	309	200	350	252	404	269	41	95	52	69
Value of product	$153.05	$69.48	$177.35	$85.60	$212.90	$94.97	$24.30	$59.87	$16.12	$25.49
Cost of feed	$75.55	$54.61	$78.13	$60.49	$83.62	$60.03	$2.58	$8.07	$5.88	$5.42
Income over cost of feed	$77.50	$14.87	$99.22	$25.11	$129.28	$34.94	....	....	$10.24	$20.07
Cost of keeping over feed	$32.54	$32.54	$32.54	$32.54	$32.54	$32.54	....	....	....	....
Profit per cow	$44.96	....	$66.68	....	$96.74	$2.40	....	....	....	....
Loss per cow	....	$17.67	....	$7.43	....	....	....	....	....	....
Return for $1 in feed	$2.02	$1.27	$2.27	$1.41	$2.54	$1.58	$9.41	$7.41	$2.74	$4.70
Feed cost of 1 pound of fat	$ .24	$ .27	$ .22	$ .24	$ .20	$ .22	$ .07	$ .09	$ .11	$ .08
Feed cost of 100 pounds of milk	$ .95	$1.03	$ .82	$ .92	$ .74	$ .82	$ .16	$ .24	$ .47	$ .26
Return for one hour's work	$ .48	$ .03	$ .75	$ .11	$1.00	$ .20	....	....	....	....
Time required to earn a day's wages of $1.80, hours	3.4	60.0	2.4	16.3	1.8	9.0	....	....	....	....

The average cost in thirty-six herds of keeping and caring for a cow was found to be in these associations during 1913 as follows:

Roughage	$34.00
Grain	25.21
Labor	21.06
Depreciation and interest	11.48
	$91.75

Therefore, when milk is selling for $1.54 a hundredweight, a cow must give 5957 pounds of milk a year before she pays her owner anything.

LIME

Until the formation of the farm bureau in 1912, the price of lime in Oneida County ranged from $4 to $7 a ton. One of the first tasks of the bureau was to investigate the reasons for this. After a thorough search, a bottom price was secured from a near-by company, shippers over the Delaware, Lackawanna and Western Railroad. With the assistance of the Utica Chamber of Commerce a more satisfactory freight rate was secured, so that in all territory covered by this railroad the price for lime was not over $2.50 a ton. Later, through the cooperation of F. S. Welsh, agriculturist of the New York Central Railroad, the farm bureau was able to secure finely ground limestone analyzing better than 95 per cent carbonates from another company for $1.35 a ton. The New York Central Railroad Company reduced the rate 30 per cent on carload shipments from all quarries that charged $1.50 a ton or less for ground limestone. This lowered the price, so that at no New York Central station in the county need the farmer pay over $2.35 a ton for good ground limestone, delivered in carload lots. At many stations it is less than $2 a ton delivered. During the time these rates have been in operation, this company has sold fifty-two carloads. Owing to the fact that the company was unable to make a profit selling ground limestone at $1.35 a ton in 1913, the price was raised in 1914 to $1.50 a ton, f. o. b. This increase is slight, however, and will be no hardship to the farmers needing lime.

The farm bureau carried on several cooperative tests with the use of lime on clover seeding at the time of sowing. These fields are in widely separated parts of the county and represent various soils and conditions. All persons who used lime report an excellent stand of clover. Many farmers who ordered one carload last year, are doubling their orders this season.

POTATOES

The farm bureau has carried on cooperative tests in potato breeding. One plot has been used for improving seed by breeding and by selection. A variety of blight-resisting potatoes was planted in 1913 to breed from. The average yield for two years of some of the better producers was from 313 to 435 bushels per acre. The female parents that proved to be good producers last year were, for the most part, good producers this

year, in most cases producing slightly more than the yield of a year ago. The average yield for two years of the lower producers not discarded at harvest in 1913, was at the rate of 183 bushels per acre. All the yield of the poorest-producing female parents in 1913 was discarded at harvest time.

This year about 400 pounds per acre of a 4-8-4 fertilizer that was mixed at home, was used. The nitrogen was supplied in nitrate of soda, the phosphorus in acid rock, and the potash in muriate of potash. The nitrate of soda was applied at two different times in order to give the plants a steady supply of nitrogen for the entire growing season. The potatoes were sprayed with bordeaux mixture five times, cultivated six times during May and June, and hilled by horse power early in July.

In addition to this experiment, cooperative spraying with bordeaux mixture for blight was undertaken in several other fields. The blight was not serious this year, but the results of spraying were very evident. The average increase in yield on six sprayed fields on five different farms in three towns in the county was 53.9 bushels per acre as compared with the yield from unsprayed fields. No rot was found in the sprayed fields, but there was some in the unsprayed. The total cost of spraying five times, from June until September, was about $7 per acre, allowing the farmer $5 per day for himself and his team. Valuing potatoes at 50 cents per bushel, the net gain is $19.95 per acre.

The farm bureau assisted the New York Central Railroad Company in running a potato train through the county. Potato schools were held in several different fields, and considerable interest was shown by the farmers.

CORN

In cooperation with Ray P. Snyder, a district school superintendent, several seed corn testers were sent to different schools. The bureau planted a small area of corn, approximately one acre, by the ear-to-row method. The seed was tested, and the kernels of only those ears that germinated more than 90 per cent, were planted. This work was started in 1913. Our seed was saved in 1913 from ears grown from parents that proved themselves to be of a high-yielding type. This seed was preserved and planted separately in 1914; in all cases the high producers in 1913 were high producers in 1914. This demonstration was to show that every farmer, without much trouble, could carry on a small breeding plot where his own seed corn could be secured. This corn furnished a mature stalk more than ten feet high, bearing an ear that matured the first week in September. The yield per acre from some of the better-producing parents was at the rate of 148 bushels of corn on the ear.

FERTILIZERS

Several farmers have cooperated with the bureau in making fertilizer experiments. Some of them used nitrate of soda as a top-dressing for meadows with good success. This was applied at the rate of 150 pounds per acre when the grass was four inches high; the cost was $3.90 per acre. In one case where accurate records were kept, the yield was $4\frac{1}{4}$ tons per acre, making the average yield for two years on the same field 5 tons per acre, or 1.7 tons increase, as a direct result of fertilizing with nitrate

of soda. Allowing one-third for shrinkage, the yield of mow-cured hay was $3\frac{1}{3}$ tons.

In a large number of cases the bureau cooperated with farmers in ordering chemicals for mixing fertilizers at home; and wherever the farmer desired, the bureau assisted him in the mixing. Many fertilizer dealers, as well as the farmers' cooperative companies, report that the present tendency is for farmers to buy more unmixed chemicals and mix them at home than formerly.

On the advice of the farm bureau, in sections where organic matter was very deficient and where barnyard manure was scarce, several farmers have sown and plowed under soy beans and, in some cases, rye and vetch, in order to return organic matter to the soil. In some cases, the soil was inoculated and lime was applied; in other cases, lime was applied but no inoculation was done; and in still others, the soil was not inoculated nor was lime applied. This afforded an opportunity to test the value of lime and inoculation on the legumes.

DRAINAGE

Assistance has been given in several drainage problems. One, in the town of Vienna, was cleaning up and draining a swamp where the black muck varied from eighteen inches to several feet in depth. The land is now practically subdued and can be worked at any time. The method of drainage used was a series of open ditches about three feet deep, three and one-half feet wide at the top, and sloping to a shovel's width at the bottom, placed at intervals of thirty-three paces apart. The New York Central Railroad Company aided in this work by giving the use of a ditcher for a short time.

PUBLICATIONS AND EXHIBITS

The farm bureau has endeavored from time to time to furnish the various papers, both daily and weekly, with seasonable articles on the various farm operations. The aim has been to adapt these articles to local problems. They covered questions of lime and liming, the renewal of old orchards, alfalfa and how to grow it, the use of bordeaux mixture on potatoes, and like topics.

At four of the fairs in the county the bureau supplied exhibits of an educational nature. At the Boonville and the Rome fairs the farm bureau had exhibits showing the results of work done by the cow-testing association, results of spraying potatoes with bordeaux mixture, and results from renewing old orchards. At both these fairs cow-judging contests for men and for boys under eighteen years of age were conducted. At the Paris Hill and the Vernon fairs exhibits of potatoes showing the difference in yield of those sprayed with bordeaux mixture and those unsprayed were shown. The average difference in yield on two different fields was 51 bushels per acre.

FARM LABOR

The farm bureau in cooperation with the New York State Department of Agriculture has acted as an agency for farm labor, and several hundred men have been given work. While not all the men furnished

turned out as well as could be desired, many of them gave good service. In one case a man furnished in the spring of 1913 is still on hand doing good service, and in two other cases the men furnished were, so the employers stated, the best that they had ever had on their farms. During the autumn a number of the local unemployed were given work on farms harvesting apples and potatoes.

ALFALFA

Another important work that the farm bureau has accomplished during the past year is cooperating with farmers in different parts of the county in growing alfalfa where it does not grow naturally. From the tenth of June until the first of July from one to two fields of alfalfa were sown each day. With perhaps one exception, where the preparation of the soil was not thorough, the alfalfa sown in 1913 gave excellent yields in 1914. It seems that wherever the field is dry enough, it is possible to produce good yields of alfalfa when proper care is taken in supplying the elements needed. The only matter to be considered is, will the necessary expense warrant establishing the crop?

VENTILATION IN STABLES

Help has been given in installing the King system of ventilation in three barns during the past year.

POISON BAIT FOR GRASSHOPPERS

In some of the sandy sections of Oneida County this year, grasshoppers were a very serious pest and destroyed many acres of farm crops. The bureau with the assistance of Professor Glenn W. Herrick of the New York State College of Agriculture helped in controlling this pest by poisoning the grasshoppers with bait similar to that used so successfully in Kansas last year for the eradication of grasshoppers. In several cases only one application of the poison bait was necessary to save crops of corn and buckwheat. However, in the more seriously infested fields, three applications were necessary.

THE BOYS' AND GIRLS' CORN AND POTATO CLUBS

In cooperation with Mr. A. P. Snyder, boys' and girls' corn and potato clubs have been carried on in the first supervisory district of Oneida County. This is the second year these clubs have been in existence, and the results are certainly gratifying. The boys and girls have raised crops of potatoes and corn and have shown them in contests this fall. An advanced contest was conducted in which boys and girls competed to show the greatest economic gain on one-quarter of an acre. The prize in this advanced contest is a trip to Cornell University or some other point of equal interest.

FARM ACCOUNTING

Last spring a bulletin on farm management was issued, which dealt with farm accounts. This was a description of the work done on a farm, giving the method of keeping cost accounts of different crops. It was sent to the farmers throughout the county and resulted in many inquiries

from various sections. From these inquiries several cooperators were secured for doing cost account work; the system is to keep cost accounts of all operations on the farm, so that at the end of the year the farmer may know what each operation cost and what it profited him, for example, what cows cost and what they returned, what orchards cost and what they returned, and so on through all the farm operations.

SUMMARY

While the farm bureau has endeavored to keep up with the individual calls throughout the county, the systematized work has interfered somewhat. However, a greater good will probably come from doing some definite piece of work in a neighborhood than from visiting several farmers and going over their farms and talking in an offhand way. It would seem that the bureau has been of practical value and that the farmers have received considerable direct financial benefit; for example, the present low rates on lime, which, before the formation of the farm bureau, were something over $5 per ton. At present the best ground limestone can be secured in the county for less than half that price. The success of alfalfa speaks for itself, and the results of spraying potatoes with bordeaux mixture cannot be disputed. Several old orchards that heretofore produced practically nothing, this year produced thousands of bushels of clean, uniform fruit.

G. W. BUSH
Farm Bureau Manager of Oneida County.

ONONDAGA COUNTY

The work of the Onondaga County Farm Bureau has naturally divided itself into two parts:

First. Project work, work of major, county-wide importance, which is to be carried on year after year until it is of great economic value to the county. There have been four of these projects.

Second. Miscellaneous work, which is occasioned by increasingly numerous calls for assistance from nearly every section of the county, and which resembles the work of a country doctor who meets a varied practice as it comes from day to day. This work is valuable and has benefited many who have sought it with sincerity.

FERTILIZER TRIALS

The most important project has been an attempt to demonstrate whether or not the theory advanced by both experiment stations in the State regarding phosphoric acid is applicable to this county. The theory is that on the clay soils phosphoric acid and lime are the limiting elements in crop production. If this be true we need only to buy phosphoric acid and lime. Phosphoric acid can be bought for from $7 to $14 per ton; lime can be bought for from $1.50 to $3 per ton. Since complete fertilizers cost $25 and more per ton, there is apparently a chance to save from $15 to $30 per ton. Results obtained the first year are not conclusive, yet the results from forty trials on as many farms seem to indicate that the theory

is applicable to this county and that the practice will spread rapidly. Farmers may be able to save many thousands of dollars in their future fertilizer purchases. Those who tested the plan this past season have already declared in favor of the phosphorus alone.

COW TESTING

Last year 1200 cows were placed on monthly tests in order to determine their yearly production of milk. This year about 1000 more have been added. Records of 28 herds have been completed for one year's work. The following figures are rather startling: Sixty per cent of the cows failed to show a profit. There were 6 herds in which every cow was a "boarder;" 18 herds in which more than half the cows were "boarders;" 2 herds in which every cow more than paid her board.

Such results should cause every dairyman in the county to study his own situation in order to determine just where he stands. Without question, such a study will furnish the most efficient basis for increasing farm profits. This has been found true for all sections of New York State. Many, if not the majority of the 5000 farmers of this county, are kept from making a substantial yearly income by a few poor cows. "Boarder" cows are fit only for the butcher.

ORCHARD RENEWAL

This county has many good orchards, which, when properly cared for, are capable of producing good crops of high-grade apples. In order to demonstrate what could be done, seven orchards in four different sections of the county were trimmed and sprayed under the direction of the farm bureau last spring. Each orchard produced large crops of good fruit. It is gratifying to notice the manner in which farmers in the neighborhood of these orchards have taken notice of the results. Requests for help have come in from them already. One orchard is especially noteworthy. It consists of twelve acres of middle-aged trees that had not been known to bear for twenty years. Many farmers said it could not be made to do so, yet this first year's work resulted in an especially fine crop of Kings and Hubbardstons. The whole crop was purchased on the trees and put into cold storage for winter delivery.

THE PRODUCER–CONSUMER MOVEMENT

The fourth of the projects has been the development of a healthy producer–consumer movement. We have not had funds with which to push this work as could be wished, but we have succeeded in placing 277 bushels of apples and 151 bushels of potatoes in Syracuse cellars. The business totaled $313.35. This is a very fair beginning, and by another fall it should be greatly extended. But it is difficult and slow work. The consumer wants a fine quality of produce at a lower price than he would have to pay at his grocer's. The farmer must agree to deliver a uniformly high quality of goods and should be paid for his delivery. The price should be, therefore, somewhere between the retail and the wholesale price. This is economically sound. That these apples and potatoes were put into consumers' cellars with general satisfaction to the consumers, is encouraging,

and the hearty response and commendation of those who knew of the movement justify special attention another year. Syracuse should buy first from Onondaga County.

MISCELLANEOUS WORK

The manager has visited 429 farms during this past summer; has addressed 25 meetings; has aided in 3 field demonstrations for the better growing of potatoes; has held 1 boys' cow-judging contest; has secured places for nearly 200 farm laborers; has promoted the sale of 2 pure-bred bulls, 120 tons of alfalfa, 400 bushels of seed oats, 50 bushels of seed corn, and some seed barley and potatoes, directly from farmer to farmer, both making and saving money for the parties concerned. He has also been instrumental in getting farmers to buy about 1000 tons of lime, 100 tons of rock phosphate, and 46 tons of feed at prices considerably below those they have regularly paid. Farmers have been advised on drainage, crop rotation, general farm practice, dairy rations, alfalfa management, mustard spraying, potato spraying, corn breeding, marketing, storage, fertilizers, and a large variety of other questions pertinent to everyday farm practice.

The men who started the farm bureau movement did not expect it to accomplish great things and to jump at once into popular favor. It could not. The work to be done by such an institution is essentially of a sort that is slow in growth and requires time. But results are sure, and the field of usefulness and the economic value to the county as a whole are unlimited.

The bureau has made a continuous and a healthy growth in interest, popularity, and usefulness to the farmers of this county. It seems to have become an institution recognized by business men and farmers alike.

S. A. Martin,
Farm Bureau Manager of Onondaga County.

NIAGARA COUNTY

On January 1, 1913, the farm bureau began its tenth month of work in Niagara County. As the manager became better acquainted with agricultural conditions in the county, certain needs became apparent, and he has been working toward the solution of these more important problems of general interest to the farmers of the county. Among them are included cooperative marketing, seed selection, drainage, better orchard management, use of lime, growing of alfalfa, and agricultural education for the farm boy and girl.

It has been the practice to respond to all personal calls for farm visits whenever possible. At first, all requests could be met, but for the past few months, neither time nor funds would permit responding to all calls. The method of travel is by train and livery, and the area covered, for the time and money expended, is necessarily small.

In order to come in contact with a larger number of farmers, the bureau has adopted the plan of sending to farmers letters containing timely advice on important subjects, and also of publishing "Timely Hints to Farmers" in the county papers.

The following is a report of some of the work of the farm bureau during the past twelve months:

Three hundred and ninety-five farmers have been visited on their farms, and the manager has received 400 calls from farmers at his office.

Twenty-eight farmers' meetings have been addressed, with a total attendance of 4250 persons.

Thirty agricultural articles have been furnished to, and published by, the papers of the county.

Five hundred and twenty-five personal letters of information have been sent out to the farmers, besides 4200 letters of general information. These letters were written on the following subjects: early spraying of apple blossom buds to control scab; late spraying of apples to control fungus on fruit; notice of apple demonstration train; treatment of seed wheat for smut; rural credits through the land bank; potato seed selection.

The farm bureau has been able to secure for the county three stops of demonstration trains that were not on their original schedules. Probably 700 farmers made use of these opportunities to visit the trains.

Following consultations with the farm bureau manager, 100 tons of fertilizer have been applied to various crops; 40 tons of fertilizer have been mixed at home for special crop production; several hundred tons of lime have been used.

Through the farm bureau the farmers of Niagara County have been able to secure lime in carload lots at a reduction of 25 cents per ton.

For general farm crops, it has been found that on the heavier types of soil fertilizers with a large percentage of available phosphoric acid give better returns than fertilizers containing a correspondingly high percentage of potash. Contrary to the belief of many persons, it has also been found that many of the soils south of the escarpment are deficient in lime, especially for growing alfalfa.

Many questions have been answered from the farm bureau office regarding the packing and marketing of fruit and farm products, the treatment of seed oats and seed wheat, the pruning and spraying of orchards, the control of the army worm, spraying to control weeds, drainage, and the like.

Last fall potato growers who selected their seed potatoes the year before by the hill method, according to the farm bureau manager's advice, reported an increased yield. One grower reported such an increase of 50 bushels per acre.

Several old orchards, which had been neglected and had the reputation of not being able to produce marketable fruit, have been cared for during this season under the direction of the farm bureau manager; the owner of one of these reports the sale of about 1800 barrels of grade " A " apples. This shows that with care many of the poorer orchards of the county can be brought into profitable bearing.

Through a petition started by the farm bureau manager, from 40 to 50 mature oak trees from 100 to 200 years of age, which had been condemned by the road department in the construction of the Million Dollar Highway through Niagara County, were saved. Only one, which stood in the middle of the highway, was removed; the road was built about many of the others. While this is not a matter of economic importance to the community, it is of a great æsthetic value. Many farmers expressed the opinion that, while they were anxious to have the road, they would prefer not to have

it if the trees must be removed. This is cited simply as an example of the many activities of the farm bureau manager that are not reported to the State department.

From the first, the bureau has fostered the idea of cooperation among the fruit growers of the county, and has been instrumental in the formation of three cooperative associations. Growers at two more places in the county have expressed their desire to receive assistance in organizing associations next year.

During November and December, in cooperation with the United States Department of Agriculture and the State College of Agriculture, a survey of 92 farms was made in one township. This data will be a basis for the future work of the farm bureau manager, and he considers it the most important community work that has been done. At first it received some opposition from the farmers, but now that they understand it, they are heartily in sympathy with it and see some of the possibilities that lie in this analysis of farmers' problems. It has been one of the chief factors in strengthening the farm bureau work with the farmers.

That the farm bureau is valued and is being used more and more by the farmers of the county, is shown by the following: During the first ten months, the manager visited 145 farmers on their farms; during the next twelve months, 360. During the first ten months, 70 office calls on the manager were made by farmers, and 40 calls by letter; during the next twelve months, 315 office calls were made, and 425 calls by letter.

E. H. ANDERSON,
Farm Bureau Manager of Niagara County.

OSWEGO COUNTY

This report of the farm bureau work covers the period from January 1, 1913, to December 31, 1914. That portion of which the writer has had personal charge, dates from September 1.

During the year 383 farmers were visited on their own farms, and 45 meetings of various kinds were attended and addressed on agricultural topics. The total attendance at these meetings was 3825, or an average attendance of 85. Three hundred and twenty personal letters and a number of circular letters have been sent out. Five circular letters on timely subjects, such as selecting seed corn and the new apple packing and grading law, have been published in all of the local papers of the county. The annual report has just been completed, and 250 copies of it have been distributed to the members of the farm bureau association and to the supervisors of the county.

A supply of all the available bulletins issued by United States Department of Agriculture is kept in this office for general distribution, and 350 copies of these publications have been distributed during the past year.

Considerable help has been secured from the State Department of Agriculture, the State College of Agriculture, and the experiment stations at Geneva and at Cornell for demonstrations and meetings.

Twenty-six farmers have started fields of alfalfa, ranging in size from one-fourth acre to four acres. The results at present are very encouraging.

Fruit trees have been pruned, and spraying demonstrations have been held in a number of orchards. Spraying rigs are being purchased by a number of men, and it is only a matter of time when all of the orchards will be given the thorough treatment that they should receive.

Individual records of dairy cows have been started on several farms, the purpose being to select and eliminate the so-called "boarder" cows. A cow-judging contest was held at the county fair in Fulton, in which a number of young persons participated.

Demonstrations illustrating the methods required by the new apple packing and grading law have been held in various sections of the county.

Apple Week, October 19 to 24 inclusive, was held in cooperation with the chamber of commerce of Oswego for the purpose of creating a market for the farmer with a small amount of fruit, and, at the same time, of enabling the people of Oswego to buy their winter's supply of apples. Over 400 barrels were sold at the chamber. Many of these were shipped to various parts of the State, as well as outside of the State, thus advertising Oswego County products. Five carloads, or approximately 1000 barrels, were sold by these means.

The acre and the quarter-acre fields of corn, which were entered in the corn contest by men and boys were measured, and the yield determined. There were 18 of these fields in different parts of the county. The object of this contest, which is financed by the agricultural society, is to stimulate interest in securing greater yields. The results this year were very satisfactory, as was shown by the yields secured and the interest manifested by the boys who took part in the contest.

The farm bureau is at the service of all the farmers in the county and can be made successful only with their cooperation. Those who are members of the farm bureau association will feel more closely in touch with the work than those who are not so related, and consequently will receive more benefit.

E. VICTOR UNDERWOOD,
Farm Bureau Manager of Oswego County.

OTSEGO COUNTY

(Work begun February 1, 1915.)

The Otsego County Farm Bureau was organized in Oneonta January 5, 1914, with 470 charter members. During the two months following February 15, 29 "Get Acquainted Meetings" were held, at which 1091 persons were present. One hundred and ninety additional members, making a total of 660, and 75 cooperators were secured at these meetings.

From \$3.80 to \$6 per ton was being paid for lime at the beginning of the season. One lime company was induced to deliver directly to farmers for from \$2.05 to \$2.25 per ton, and the Otsego and Herkimer Railroad Company was prevailed on to install a grinder at the Richfield Springs quarry and to deliver either in box or side dump cars at from \$2.25 to \$2.40 per ton. Report has been made to the farm bureau of 40 carloads, 1080 tons, of ground limestone sold in the county at these prices. Probably two-fifths of this was spread on plowed furrows this fall, a practice that the farm bureau is advocating.

Through the farm bureau in cooperation with the six school superintendents, about 125 boys were induced to plant 25 potatoes each, by the tuber unit method. The farm bureau, through subscriptions from members, was able to give a holstein bull calf and a trio of fowls as prizes in a contest among the winners of the six districts.

Field meetings have afforded excellent means of getting in touch with members. Practically the same things were discussed at these meetings, where from six to sixty men gathered, that were discussed when making farm visits. The men seemed free to discuss their problems. The 18 meetings were held on farms where the growing of alfalfa, the growing of vetch with oats, varietal tests of silage corn, and the use of fertilizers were being demonstrated. There were 340 men at these meetings. It is the plan to double this phase of the work for 1915.

The Cooperstown and the Springfield Cherry Valley Cow-Testing Associations have been organized with 26 herds in each, with a total of 935 cows. The tester of the first-named association is a graduate of Morrisville, and of the latter a graduate of Cornell; both are Otsego County men.

The local fair proved to be a convenient means of reaching farmers. Fully 1000 persons learned that there was a farm bureau in the county if they learned nothing more. The bureau had an exhibit at Cooperstown and at Morris. The county supports five fairs, and I hope to use them as far as possible next year.

Orders have been placed for 348 tons of 16 per cent acid phosphate at a saving of $1444 over the cash price on December 15. Orders are now being taken by farm bureau committeemen for four more carloads. All orders have been placed in the hands of a dealer, whenever it could be so managed, who handled the money and unloaded the goods for which he received 50 cents per ton, a price which was agreed on by the dealers. This is the best method of purchasing that can be followed by a farm bureau. It has been supported by the boards of trade for 1915.

Perhaps, since this is a dairy county, the work we have done that should result with the most good to all is the organization of two breeders' clubs, a holstein club and a guernsey club. The former has 39 charter members who own 1025 pure-bred and 715 grade animals; the latter has 23 charter members. A cattle census has not yet been taken. The members aim to improve the quality of cows throughout the county by preaching and practicing the doctrine of community ownership of pure-bred sires. Ten days ago two members of the holstein club for the first time purchased a bull together, for which they paid $500, and his record warrants the price. We believe the farm bureau exerted an influence in this purchase. These breeders' clubs are closely affiliated with the farm bureau. The officers of each have been appointed members of standing committees of the bureau. Article 3 of the constitution adopted by the clubs reads as follows:

> This club shall be an auxiliary of the farm bureau and shall work in cooperation with that association. Each member of the club shall be a member of the farm bureau in order that the stenographer of that association may become the assistant secretary of the club. Each member of the club will then be entitled to use the monthly sales list and exchange of the farm bureau. It is the intention and the expectation of this club at all times to work in conjunction with the holstein-friesian association.

The first issue of our sales list and exchange was sent to 700 men on December 1. There was more than $20,000 worth of stock advertised.

The grange has been at all times willing to cooperate with the farm bureau. There are twenty-four subordinate granges in Otsego County, and many of them have held joint meetings with the farm bureau. An opportunity has been extended to the manager to meet the members of the Pomona grange at each of their meetings. The manager assisted in arranging for two debates, one of which drew an attendance of over 200 at a village eight miles from a railroad.

Nine farmers' institutes have been held in the county with a total attendance of 2081. The work of the institute should be more valuable than ever in counties that have bureaus. Even though we discuss the same subjects, they are presented in different ways.

Our annual meeting, on December 1, proved to be a success. There were more than 300 men at each of the sessions. Dr. J. F. Devine of Goshen and Professor K. C. Livermore of Ithaca delivered addresses. The chairmen of committees on cooperation, poultry, sheep, horses, holsteins, and guernseys reported. Of the 203 men who paid for membership for 1915, 65 are new members. Since farm calls were made on members of the bureau only, except in a few cases of special requests by nonmembers, the increased membership shows a growing appreciation of the work done. Township committeemen, of which we have 67, are reporting many new members.

FLOYD S. BARLOW,
Farm Bureau Manager of Otsego County.

ST. LAWRENCE COUNTY

St. Lawrence is a dairy county, and the work of the farm bureau has been mainly in connection with this industry. However, intense specialization in one branch of farming is not generally wise. For this reason the farm bureau has tried to develop in the farmers an interest in other branches of farming that might be carried on with dairying.

The work in dairying has been, first, the devleopment of a greater interest in pure-bred cattle; second, the advocating of a more general use of pure-bred sires from high producing families in breeding grades; and third, the elimination of low producing animals from the herd. The last has been accomplished through cow-testing associations and by arousing in the farmers a greater interest in weighing and testing the milk of each cow in the herd.

The manager has cooperated with granges, agricultural fair associations, farmers' institutes, a breeders' association, a cow-testing association, and small agricultural clubs from the beginning.

Other work of the farm bureau has been the arranging of farm demonstrations. They have been planned for the following purposes: (1) to show the value of drainage; (2) to show the value of chemical fertilizers in growing hay; (3) to test the relative value of certain new as well as certain well-known varieties of fodder crops; (4) to increase the yield and the seed quality of potatoes.

Drainage is generally acknowledged to be one of the big problems in this county. Several farms were visited where tile drainage is used.

A study of crop conditions and particularly of the history of the farm always showed a striking improvement from conditions before drainage. Basing plans on a general drainage survey in the county and on successful drainage experience, a ditching and drainage demonstration and field meetings were held. These field meetings were attended by about 200 farmers who were deeply interested in the discussions and in the work. A carload of tile was ordered by a group of farmers just before one of the demonstrations was held. A twenty-acre field was surveyed and mapped for tiling and part of the work of ditching and laying the tile was done during the demonstrations.

The tests with chemical fertilizers on hay fields, while in several cases interfered with by the severe summer drought, in most cases showed a profitable increase in the yield of hay. With the demand for market hay at a good price it is believed that growing hay for market through the use of chemical fertilizers, can be made an important adjunct to dairying.

A considerable number of farmers have been interested in testing the value of winter vetch as a supplementary forage crop in growing oats and in the succeeding clover crop. The results are very encouraging, and many more farmers will try the experiment this year. A bulletin on this subject has been published jointly by the St. Lawrence and the Jefferson County farm bureaus.

The question of what kind or kinds of corn are best adapted to the climate and other local conditions in this county is one that has been under discussion very generally during the past few years. With the hope of sorting out a few desirable kinds, four comparative tests of ten varieties of corn have been made in four distinct sections of the county. This work has not reached completion, but the field work indicates that there are a limited number of varieties that can be relied on to produce mature silage in this county.

Finding that there are many sections in the county with soils well suited to the production of potatoes and believing that this crop might be made an important adjunct to dairying on many farms, the manager has endeavored to interest as many farmers as possible in growing the crop.

The production of choice seed potatoes is likely to be an important industry for the farmers of this county in the near future. There is sure to be a demand for seed potatoes that are free from dangerous diseases. Thus far no powdery scab has been found within this county. However, there are other diseases common to potatoes that it is important to prevent if good prices for seed potatoes are to be obtained.

Whenever possible farms have been visited for the purpose of giving advice or suggestions. It may be of interest to add that more than half of the specific calls for assistance have been on drainage problems. A variety of questions are naturally asked in connection with these calls, and they extend all the way from plans with regard to the construction of barns, through the various farm cropping operations, down to questions of how to raise more turkeys, and how to get more eggs in winter when the hens do not lay.

In general a feeling of sympathy and cooperation toward the work of the farm bureau is manifesting itself wherever farmers have acquainted

themselves with the work. Granges, agricultural fair associations, and boards of trade are assisting financially in a limited way, but more particularly are they cooperating in the various localities to arouse the interest of the farmers in the assistance that the farm bureau can give. Only as organizations and individuals ready to cooperate in the work are found, can the best results be secured.

C. S. PHELPS,
Farm Bureau Manager of St. Lawrence County.

TOMPKINS COUNTY

Farm bureau work was begun in Tompkins County December 1, 1913, under an arrangement that called for two-thirds of the manager's time to be spent doing county work and one-third assisting the State Director of Farm Bureaus. About March 1, M. C. Wilson was secured as assistant in order that the manager might be free to give more of his time to State work. On November 1 the full services of V. B. Blatchley were engaged, and the former manager became Assistant State Director.

At its inception practically all the local support, both moral and financial, that the bureau received, came from the Tompkins County Breeders' Association. It was but natural, therefore, that a good deal of work should be done to assist this organization to carry out its aims.

This work has consisted during the past year of editing and publishing the *Tompkins County Breeders' Journal*, each month, the development of the sales and purchasing department of the association from a total annual business of about $100 to nearly $8000, and a general stimulation of the movement to improve live stock in Tompkins County, which has resulted in increased membership in the breeders' association and in a considerable increase in the number of pure-bred animals kept in the county.

Orcharding has been profitable in Tompkins County for those men who have gone at it in the right way. Drawing a lesson from their experience, 75 acres of apple trees on 30 farms were pruned and sprayed under the direction of the manager of the bureau. The apples from these orchards brought fancy prices in the market in Ithaca when offered for sale.

An apple day held in cooperation with the Ithaca Business Men's Association was voted a success by both consumer and producer.

Probably more far-reaching in its ultimate effect on the agriculture of the county than either of the two lines of work mentioned was the campaign for cheaper lime. Briefly this resulted in the establishment of three new and lower freight rates, practically direct sale to farmers, and the proposed establishment of a new source of supply at Union Springs. The development of the last proposition has, however, been delayed by existing financial conditions.

The three major lines of work have been outlined. Of less importance as regards time spent on them, at least, were (1) the holding of a boys' potato-growing contest in Dryden and three stock-judging contests at the local fairs; (2) a series of mustard-spraying demonstrations; (3) a number of demonstrations on the control of oat smut and stinking smut in wheat; (4) the laying out of drainage systems on ten farms; (5) the control of the army worm; (6) the making of several plans for farm buildings; (7) in-

troductory work looking toward the reorganization of the Ithaca Poultry Producers' Association; (8) participation in placing and conducting farmers' institutes and farm demonstration schools; (9) the introduction of hardy strains of alfalfa; (10) the conducting of a pure-bred live stock survey.

The work of the past year was introductory in character. It was not as well planned as it might have been, and, due to the arrangements under which it was done, it was naturally broken up more or less. The fact that at the close of the year it received the hearty approval of those agricultural organizations in the county that had at the beginning refused to endorse it, is its best justification.

V. B. BLATCHLEY,
Farm Bureau Manager of Tompkins County.

ULSTER COUNTY

(Work begun April 15, 1914.)

The first year of the farm bureau was spent to a large degree in picking out and conferring with the men who could be depended on to assist in the work and in becoming acquainted with the topography of the county, with the farmers and the location of their farms, with the resources and the possibilities of the county, and also with its fundamental agricultural problems and the best available means of their solution. The following report to January 1, 1915, shows the work accomplished in the eight and one-half months that the farm bureau has been established.

Three hundred and twenty farmers have been visited on their farms. Fifty-five persons, seeking information and advice, have called at the office. Six hundred and fifty-four individual letters have been written in reply to inquiries received and in transacting the business of the bureau. Five circular letters, totaling 1500 copies, have been sent out to the members giving information, suggestions, and inspiration.

Twenty-five newspaper articles, giving agricultural information and dealing with farm bureau affairs, have been written and published in all of the local papers. In this way authoritative information was made available to all fruit growers about a cheap and sure method of controlling the red spider, the pest of raspberries. Up to the time this article was published, some growers were spraying with bordeaux mixture, some with arsenate of lead, which was a waste of time and money. Other articles were prepared in connection with the campaigns against fire blight and wild carrot, a weed that disgracefully infests a large part of the county. A fourth article made plain the facts about Stone Meal, a fertilizer which costs the farmer $23 per ton and contains soluble fertilizer constituents worth but $4.50 per ton, according to the New Jersey Experiment Station.

Twelve field demonstrations of agricultural practices that were new to the community, have been made to groups of farmers.

A cow-testing association was organized at Wallkill, and is now in operation. It is the first of its kind in the county. Gradually farmers are realizing that the profits in the dairy business depend on the net profit of the individual cow and to that end are keeping records. An association is being organized in the Rondout Valley, which will be brought to com-

pletion sometime in January. Other associations will be organized throughout the county as fast as a sufficient number of dairymen come to appreciate work of this kind.

Through teachers' conferences, addressed at the invitation of the district superintendents, information in the teaching of agriculture has been given to all the teachers in the county. More and better agricultural instruction has been given by many teachers, and the prejudice against life in the country has been removed from the teachings of many others through the efforts of the farm bureau.

The farm bureau has cooperated with the district superintendents of schools in holding a county-wide corn-growing contest for boys and girls outside of Kingston and a potato-growing contest for boys and girls in Kingston. Considerable time has been devoted, in cooperation with the schools, to a vegetable-growing contest throughout the county for the coming year.

The bureau also cooperated with the Department of Pomology at the State College of Agriculture and the New York Central and Hudson River Railroad in running a fruit-packing demonstration train through the fruit sections of the county. This met with great success.

In cooperation with the Ulster County Poultry Association there was held in Kingston the most successful poultry show up to the present time.

Through cooperation with the business men of Kingston a winter agricultural fair was held, the first of its kind in the county. The way has been paved for a very successful annual fair of this kind.

A number of phases of agriculture have been investigated to the point where some satisfactory conclusions have been reached. The nature of the work covers a large range of subjects, such as diseases and insect pests of peaches, apples, pears, grapes, quinces, cabbages, spinach, asparagus; draining, liming, and fertilizing fields; rearrangement of buildings; top-dressing of meadows; selection of heavy laying hens and breeders; care of woodlots.

Thirty-three meetings have been addressed by the manager in advertising the bureau and in bringing certain points to the attention of communities. Attendance at these meetings was approximately 4975.

The attitude of the farmers toward the work of the farm bureau since they learned that an effort must be made on their part to secure any real benefit from the bureau and that suggestions and advice were not to be forced on them, has been one of the greatest friendliness. Their appreciation of the services rendered could not but be satisfactory to the most exacting person. Farmers, young and old alike, have requested suggestions and advice. They have willingly responded when called on for assistance and are cooperating for the improvement of their communities.

For the coming year twelve farmers want the cooperation of the farm bureau in growing their first acre of alfalfa. Twelve other farmers have requested instruction in pruning their orchards. They have some notion of how to prune a young orchard but are looking to the bureau to point out what has been found by extensive practice to be the best method. Four farmers have requested personal assistance in spraying their fruit trees. These farmers are not in the fruit belt of the county, but they wish to adopt the best practices in fruit growing. Five farmers want the

assistance of the bureau in drainage projects. A large number of farmers have requested the manager to visit their farms and give his approval or disapproval of the practices in use. Quite likely these farmers will not be visited until a definite piece of work demands the manager's attention.

The granges throughout the country are very friendly toward the farm bureau and, like the business and professional men of the town, are in favor of the work.

Although much has been accomplished, there is much to be done because Ulster County was entirely new territory for farm bureau work. However, honest effort has been made, and the manager has employed his time to the best of his knowledge. With this preparation, the farm bureau work of Ulster County for the coming year ought to be decidedly worth while.

W. H. Hook,
Farm Bureau Manager of Ulster County.

WYOMING COUNTY

The following is a brief summary of the work accomplished in Wyoming County from March 1, 1914, when the writer succeeded W. H. Markham as manager of the farm bureau, to January 1, 1915.

Following the work of the institutes held in March in interesting farmers in keeping individual records of dairy cows, four cow-testing associations were organized, aggregating 132 members and 2200 cows. These associations are in successful operation under the direction of competent men. They are controlled by strong local organizations made up of some of the best men in the community. Much attention is being given to balanced rations, and a considerable financial saving is the result. According to the reports of several members of the association, the reduction in cost of maintenance amounts to several thousand dollars, while the production of the herds has been increased.

Recently a county breeders' association has been organized; it is made up of some of the most successful breeders of pure-bred stock in the county. No definite results from this as yet have been secured, but the aim is to encourage the better breeding and the better marketing of pure-bred stock.

An orchardists' association has just been organized in Wyoming Valley for the purpose of orchard improvement and cooperative marketing of fruit.

Considerable attention has been given in some localities to the development of the idea of cooperative buying and selling and to the establishment of storage facilities for farm products. It is hoped that there may be successful organization along these lines. This covers the work accomplished and attempted in organization.

The manager of the farm bureau has attended 66 meetings in the county, and has spoken on agricultural subjects to audiences aggregating over 6000 persons. Twenty of these meetings were farm bureau meetings called for specific purposes, and 23 were grange meetings. Of the farm bureau meetings 3 were demonstrations, 2 in apple packing and 1 in the control of bean diseases. At this meeting the suggestion was made

that the farmers finance a fellowship in the State College of Agriculture for the purpose of establishing a laboratory to study bean diseases in the county. Acting on this suggestion the matter has been arranged with the College, and $500 has been raised toward a fund for this purpose. Another popular meeting was a picnic held on the county farm.

Two hundred and twenty-four individual farms have been visited on request, and a great deal of advice and information on agricultural subjects has been given. Four hundred and seventy-two farm visits have been made. It is the opinion of the manager that this work has been too miscellaneous in character. Drainage, orchard management, use of lime, alfalfa culture, and dairy work have been mainly emphasized in these farm visits.

Thirty-six circular letters, numbering 2329 copies, were sent out from the farm bureau office, and 540 letters were written to farmers.

In order more fully to extend information on seasonable topics and in order to bring the farmers into close affiliation, the farm bureau publishes a monthly paper edited by the manager. This paper, known as the *Farm Bureau Herald*, is sent to all members of the bureau. The expense of publishing, about $25 per month, is paid partly by advertisements of pure-bred stock and partly by membership fees. This paper is greatly appreciated by the members.

The extension work for the coming winter in this county consists of four farm demonstration schools and one farm home demonstration school. These schools aggregate over 200 members. In addition to these there are a considerable number of farmers' meetings arranged for in localities inaccessible to demonstration schools and institutes. These meetings are uniformly well attended and result in the general development of interest.

There is a steady development in the county toward cooperation between the farmers and agricultural agencies, especially toward cooperative marketing. It is very probable that this movement will take definite form as soon as some workable plans are drawn up.

The manager is pleased to report the most hearty and encouraging cooperation and support from the officers of the bureau and the farmers of the county, as well as a very large measure of helpfulness from the United States Department of Agriculture, the State College of Agriculture, and the experiment stations. He believes that it is the coordination of all these forces that will tend to future success in the greatest measure.

H. M. BOWEN,
Farm Bureau Manager of Wyoming County.

REPORT OF NEW YORK FARM MANAGEMENT EXTENSION AGENT FOR SEPTEMBER TO DECEMBER, INCLUSIVE

The farm management extension agent's work is to assist the farm bureau managers in studying the profits or the losses on a large number of farms and to find out, as far as possible, the reasons for successes and failures. In as much as the manager's endeavor is primarily to increase farm profits, he will do well to acquaint himself with what the farmers in his county are making and how they do it. The purpose of this work,

then, is to encourage and show farmers how to summarize their year's business in order to see how it pays and what can be done to make it pay better.

CHAUTAUQUA COUNTY PROJECT

The first project was started with the Chautauqua County Farm Bureau, September 29, 1914. The farm bureau manager, Mr. Rogers, had taken twenty survey records before September 29. Messrs. Williams, Miller, and Watrud from the United States Department of Agriculture worked on the project part or all of the time. Ninety-seven records were taken. These were worked out, and the labor incomes computed at the bureau office.

A few tabulations were made. The farms were divided into four groups, according to the receipts per cow. Farms with good cows made twice as much as those with poor cows.

Average milk receipts per cow	Average labor income	Number farms in group
$47	$327	13
67	374	23
84	550	20
104	870	16

The same farms were arranged according to number of acres in crops. This arrangement did not cause the labor incomes to increase as regularly as they did in the grouping by cow receipts.

Average crop acres	Average labor income	Number farms in groups	Average number cows	Average milk receipts per cow
19.6	$298	14	7.2	$76
29.3	441	17	11.3	75
39.3	700	18	14.3	75
53.7	569	17	14.6	77
73.0	653	15	19.8	79

The labor income does not increase after the third group. Farmers in the vicinity of Sherman specialize in dairying.

The average crop sale amounts to $135 per farm, which is about eight per cent of the total income. Increasing the crop acres does not increase the crop sales. As more crops are grown, more cows are kept to consume them. There are seven cows per farm in the first group and twenty in the last. It will not pay some of the farmers about Sherman to keep more cows. It might pay, however, to develop another source

of income to add to the milk receipts. In many regions in the State this is found profitable. The first table indicates that increasing cow receipts will increase profits. The second table shows that increasing the size of the farm in order to keep more cows, pays better up to a certain point, but that beyond this point more cows do not increase the profits.

An outline was prepared for returning the records. The capital, the receipts, and the expenses of each farm were filled out on one of these blanks and returned to the person who gave the information. A letter describing the outline and the results of the work accompanied each returned summary. The outline and the letter sent to one of the farmers accompanies this report.

About twenty-nine of the farmers to whom letters and outlines have been sent, have been visited. The others should be visited in the near future. All of the farmers visited understood the outlines and the letters. Some corrections in the records were made; however, the farmers usually agreed to the conclusions shown by the outline. It is very difficult to clinch the whole matter by planning some changes for the coming year with the farmer that will really increase his profits.

SUMMARY OF CHAUTAUQUA COUNTY PROJECT

	Records taken	Records returned by letter	Records yet to be returned	Farms revisited after letter had been received	Farms yet to be visited
Mr. Rogers	31	26	5	....	31
Mr. Williams	14	14	0	6	8
Mr. Miller	17	15	2	2	15
Mr. Watrud	8	8	....	5	3
Mr. Scoville	27	27	....	16	11
Total	97	90	7	29	68

Recommendations for further work

Each farm surveyed should be visited again before spring.

The 1913 record should be gone over and discussed. In every possible case definite plans should be worked out for 1915.

The 1914 record should be taken at this time.

NIAGARA COUNTY PROJECT

The agent gave a talk at the Niagara County Pomona Grange in November describing the project.

The agent and the manager of the farm bureau began taking records in Niagara County November 24, 1914. Ninety-five records were taken, most of which were computed in the farm bureau office by the manager and his assistants. The agent has checked these records. No tabulations have been made, and no records have been returned.

Recommendations for further work

It is recommended that tabulations be made by agent and manager, that outlines be worked out to return records, and that records be returned in person by appointment and a 1914 record obtained during this visit. The agent will need to devote nearly a month with the manager to this work.

ALLEGANY COUNTY PROJECT

On January 5 the agent with the Allegany County Farm Bureau started a project. The manager had taken about thirteen records. The agent. and manager took twenty-one more records during the week of January 5. The manager plans to finish the records alone. The agent will work up the records and help him in making tabulations and outlines.

TOMPKINS COUNTY PROJECT

The agent worked two days, January 12 and 13, with the manager of the Tompkins County Farm Bureau. Nine records were taken. The manager expects to take the rest of the records this winter. The agent will compute them and help the manager in making tabulations and in working out an outline.

G. P. SCOVILLE,
New York Farm Management Extension Agent.

SAMPLE LETTER USED IN RETURNING SURVEY RECORDS TO FARMERS

Ithaca, N. Y., October 17, 1914.

Mr. ————,
R. D. 51,
Sherman, New York.

Dear Sir:

Enclosed please find an outline of your farm business as you gave it to me last month. This outline is arranged to figure what the farmer makes for his labor.

To do this it is first necessary to find the total capital invested in the farm, stock, tools, and the like. Your capital as shown at the beginning of the outline foots up to $7473. A list of the receipts and expenses follows: Your receipts of $1204 exceed your expenses of $849 by $355. In the expenses is not included the value of your own work. This $355 represents what is left for your pay together with what the capital should earn.

If we figure the interest on your capital of $7473 at the common rate of 5 per cent it would amount to $374. This interest exceeds the net receipts of $355 by $19. The farm lacked $19 of having a labor income.

The printed figures to the left of the items are averages of the better paying farms that we visited about Sherman. This shows in detail their business, which resulted in an average labor income of $1342. There are of course a number of conditions that influence farm profits, but three of them are so important that they almost always account for the farm's success or failure. On the other side of the outline these factors are shown for your farm in comparison with all the farms studied about Sherman, and with the better farms.

The study of several thousand farms in New York State (Cornell Bulletin 349) shows that it is very important to have a fair- or large-sized farm and business. The chances of doing well in general farming and dairying increase very rapidly as the size of the farms increases up to 175 acres. The large farms have a greater income and use machinery and labor to better advantage.

Your farm is a little smaller than the average of the best farms. Your receipts are only a little more than a third as large as theirs. To make as good a labor income as

the better farms it is necessary to have $3000 receipts or more. Some farmers increase the size of their farms by buying additional land. Some persons rent adjoining land and work extra land with about the same help and tools. Some of the pasture land can often be plowed up for crops and the business thus increased. The farm business can be increased by more intensive farming. In this region some intensify by the keeping of poultry or pure-bred stock, or by growing potatoes. I should like to get your opinion as to the advisability of increasing your business and the ways it could be done.

It has also been found that it generally pays best to have at least two or three important sources of income rather than one. Your business might pay well with income from three sources, milk, cattle, and poultry, but each of these enterprises should be larger. Ordinarily, a good cash crop added to the stock income pays. There seem to be very few cash crops grown about Sherman. In regions studied where cash crops are grown, farmers that get about half of their income from the sale of crops and the other half from stock, make nearly twice as much money as those who depend entirely on a stock income.

The quality of a dairy farm can be measured by the receipts per cow and crop yields. Your receipts per cow are $33 below the average and not quite half as large as the best. There is no surer way of losing money than to keep cows that do not pay their feed bill. This is probably the weakest part of your business and ought to be the most easily corrected. Larger returns per cow are usually the result of better cows and better feeding. Your feed bill is high. It looks as though you had some poor cows. A satisfactory way to select out the poor cows is to keep a record of the milk produced by each cow by weighing it every tenth day or oftener. I would like to have your opinion in regard to the possibility of increasing your dairy receipts. We may have made some error in getting this information.

Your crop yields are very good. This record seems to show that your greatest opportunity lies along the improvement of your cows. It may also be worth your while to consider the possibility of adding another important income to your business together with the milk.

I expect to be in your vicinity again next week and will surely stop around to see you if possible, and discuss this outline.

Thanking you for your cooperation, I am,

Very truly yours,

FARM MANAGEMENT EXTENSION AGENT

RECORD OF A YEAR'S BUSINESS

On thirteen good Chautauqua County dairy farms for 1913 — On your farm for 1913

Value	Number	Capital	Number	Value
$7,457	128	Total acres	120	$4,800
1,517	19	Cows	17	850
528	15	Other cattle	13	300
693	4	Horses and colts	4	300
13	2	Sheep	....	....
14	1	Hogs	1½	38
133	167	Hens	250	125
643	......	Machinery	....	700
254	......	Hay and grain	....	160
85	......	Cash	....	200
$11,337	......	Total capital	....	$7,473
		Receipts		
	$3	Sweet corn	....	
	122	Potatoes	....	
	6	Grain	....	
	7	Hay	....	
	19	Peas	....	
	43	Apples	....	
	73	Maple syrup and sugar	$60	
	41	Outside labor	22	
	1,813	Milk and butter	700	
	691	Cattle *	276	
	368	Poultry* and eggs	100	
	68	Horses and colts*	....	
	9	Sheep* and wool	....	
	52	Swine	46	
	43	Increase in feed inventory	....	
$3,358	......	Total receipts	....	$1,204
		Expenses (Cash)		
	$179	Hired labor	$42	
	58	Machinery	83	
	57	Buildings	54	
	12	Fences	12	
	603	Feed	408	
	46	Milk hauling	60	
	42	Seeds	15	
	67	Fertilizer and lime	65	
	29	Threshing and silo filling	13	
	11	Machine work hired	....	
	9	Insurance	3	
	48	Taxes	34	
	31	Minor items	16	
		Expenses (Not cash)		
	52	Board of hired help	24	
	205	Family labor†	....	
		Decrease in feed inventory	20	
$1,449	......	Total expenses	....	$849
$1,909	......	Income from capital and operator's labor (Receipts minus expenses)	....	$355
567	......	Income from capital (5 per cent interest on capital)	....	374
$1,342	......	Labor income	....	—$19

* The receipts from stock are found by subtracting the sum of the purchases and what is on hand at the beginning of the year from the sum of the sales and that on hand at the end of the year.

† Except that of the operator of the farm.

FACTORS THAT DETERMINE PROFITS IN FARMING

	Chautauqua County Dairy Farms, 1913			
	Your farm		Average of all records 81 farms	Average 13 better paying farms
	191......	1913		
Labor income	....	—$19	$546	$1,342
Size				
Total capital	....	$7,473	$7,680	$11,337
Total acres	Acres	120 acres	122 acres	128 acres
Crop acres	Acres	38 acres	44 acres	53 acres
Number cows	....	16	13	19
Total receipts	....	$1,204	$1,822	$3,358
Diversity				
Sources of income over $100				
Milk	....	$700	$1,037	$1,813
Cattle*	....	276	295	691
Poultry*	....	100	175	368
Potatoes		....	....	122
....	....	....	....	....
....	....	....	....	....
Quality				
Milk receipts per cow	....	$44	$77	$95
Yields per acre				
Silage corn	..... tons	.... tons	7¾ tons	6½ tons
Potatoes	..... bushels	40 bushels	120 bushels	155 bushels
Oats	..... bushels	38 bushels	37 bushels	40 bushels
Hay	..... tons	2.3 tons	1.9 tons	2.3 tons
Total expense	....	$849	$888	$1,449
Labor expense	....	66	255	436
Feed purchased	....	400	357	603
Feed purchased per cow	....	31	27	32

*See footnote on other side.

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